

## Ten Steps to a High-Tech Start-Up

Typically, high-tech start-ups follow a series of common steps. Some examples of the experiences of high-tech companies I've watched—all of them started by physicists—will help illustrate how to negotiate the sometimes-torturous path from concept to success.

1. Gather your team around the idea. Experience is invaluable to the management team of a start-up company. With so many daily decisions to make, you need people who are familiar with your market, your technology, and the internal operations of a company like the one you're starting.

Most likely, you are a technologist with an idea that is key to a new high-tech company. But your company will also need skills such as product development, marketing, sales, manufacturing, and finance. If none of your founding group possesses these skills, you need to recruit people with the requisite backgrounds to fill out the team. Your funding source may be able to help you find the talented individuals you need.

2. Do your market research. Starting your company will take a lot of time, effort, and money—yours and that of others. So before you get too far: Get into the marketplace, talk to potential customers, and make sure they want to buy your product. It would be a shame to waste money and talent on a nonexistent market. This may seem an obvious point, but many entrepreneurs overlook it.

In addition to confirming the basic need for your product, you should seek to confirm your all-important competitive advantage during this research phase. A competitive advantage is the reason customers feel compelled to buy your product rather than competing alternatives.

Another must during market research is refining your definition of the product. What level of performance is needed? How should the product be packaged? What degree of complexity do customers want? For instance, an optical spectrometer could be offered as a simple monochromator, or as an instrument that displays a spectrum, or as a sophisticated analytical system that identifies molecular species. What does yours do?

You can learn many other things from potential customers. They will describe various applications, some of which may require additional product design to satisfy. They can help you scope the size of the potential market. They will have lots of information about competitors—information that is hard or impossible to get otherwise. Perhaps the most valuable information you can secure is how customers perceive the value of your product; that is, how much you can charge. Best of all, the people you visit will usually become your first customers. After all, they were involved in defining the product.

Aculight, a laser manufacturer in Seattle, provides a good example of successful market research. The scientists running the company carefully targeted potential customers to consult before launching their first, and then second, product. With that approach, they had no surprises bringing their products to market and were able to find their important first cus-

tomers each time without difficulty.

3. Write your business plan and secure seed funding. There are always expenses associated with the initial phases of a company. Even if the founders draw no salary at first (which is common), there will be travel expenses, service fees for attorneys or other outsiders, and product development purchases such as parts and equipment. So you will need an initial injection of funds, typically \$50,000 to \$500,000, to get you through the first six months or so.

You come to appreciate the value of a business plan when you start a new company, because plans are a primary tool for securing funding. When making your first contact with a funding source, you can bet the investor will ask for a plan to read (see Business Plan Outline at left) before taking the conversation to the next step.

How much detail should your plan include? You want to put a complete story in front of potential investors, but without intimidating them with a lengthy tome. The venture capitalists I know say they read many plans each week, and they prefer short ones to long ones, just in the interest of time. So make your story crisp, focusing on the essence of the business and on your cash requirements. A good book on writing business plans can be helpful.

If you and your partners have the resources to put up the seed money yourselves, you should do so. Most other means of funding require sharing ownership of the company with investors (see Sources of Funding, p. 30). As a general rule, you should strive to maximize your personal ownership of the company at the initial funding, when the leverage is greatest.

4. Hire the needed people and occupy a facility. At the beginning, your greatest need is for engineers and scientists to staff product development. There is little need to have sales or manufacturing people on board until the product design is well along. In addition to technical talent, however, you need to cover two other areas of expertise—finance and marketing.

An experienced finance individual can help

### BUSINESS PLAN OUTLINE

#### 1. Mission statement

#### 2. Executive summary

#### 3. Market situation

Description of customer

Customer needs

Market size, growth,  
and segmentation

Key influences

#### 4. Competitive situation

Strengths and weaknesses  
of competitors

Product comparison

Competitive advantage

#### 5. Objectives

#### 6. Product strategy

Technology strategy

Description of new products

Product-development schedule

#### 7. Strategies and tactical plans

Marketing strategy and positioning

Manufacturing strategy

Other strategies

#### 8. Functional plans

#### 9. Financial plan

#### 10. Appendices

you negotiate with investors and prepare the business plan. Since these needs might not add up to a full-time job, you can look for less-than-full-time help. One such example is the “part-time chief financial officer,” who is an integral part of the business landscape in

places such as Silicon Valley.

Equally important, your company will need a marketing professional to help conduct the needed initial market research and business planning. Business plan content such as product definition, competitive

analysis, and market strategy needs the guiding hand of experience.

As for facilities, all you need is adequate space for the technical job at hand. Save the attractive office space for later. Your initial investors will appreciate that you are conserving cash by starting out in modest facilities. One example of modest beginnings is New Focus (Santa Clara, CA), a manufacturer of mechanical and optical tools for the electro-optics research marketplace. Milton Chang started New Focus in the rear half of an industrial space leased by a sister company. As it grew, New Focus moved twice into ever more impressive facilities.

You can compromise on the appearance of your initial facility, but don't skimp on the equipment used by your technical staff. People are most productive when they have the latest productivity-enhancing tools.

5. Demonstrate the feasibility of your product design. Product feasibility is a key milestone in the life of a high-tech start-up company. You need to know as early as possible whether the product idea will work. So you should work toward a feasibility demonstration before raising a lot of money. By meeting this milestone before significant fund-raising, you will also maximize the value of the founders' investment in the company.

You don't need a final-looking product design to prove feasibility, just a “breadboard” containing all the key parts. Note that this is the stage at which you can file patents on your inventions, having demonstrated the validity of your ideas.

Xsirius, now Advanced Photonix, Inc. (Camarillo, CA), exploited federally funded research in avalanche photodetector technology performed at the University of Southern California's Institute of Physics. Thus, the company already had demonstrated feasibility when it was formed. This approach enabled its founders to raise enough money to acquire an existing detector company, which provided the manufacturing and sales organizations that Xsirius lacked.

6. Raise first-round funding. If you now have a technology that works, and a product definition that will penetrate a market, it is time to move to the final phases. The next

steps—including designing and testing the final product, establishing distribution channels, setting up manufacturing, buying inventory, and equipping facilities—can require a large investment. Some of these expenses are greater than you might think. For instance, software entrepreneurs are often surprised at the high cost of setting up distribution, which often exceeds the cost of product development.

This is the time for what is called the first round of funding. Sometimes the same sources that provided you seed money will support you again, but usually you will need deeper pockets. So most entrepreneurs seek first-round funding from venture capitalists or corporations.

Before approaching potential funding sources, you should bring your business plan up-to-date. This can take time in addition to the time investors require for their decision-making. Plan ahead and start well before you actually need the money. Also, investors frequently request specific changes to a plan before investing, so you need to be flexible.

Gemfire Corp. (Mountain View, CA) is a manufacturer of flat-panel displays. Their basic technology was developed using funds from the U.S. government's Small Business Innovative Research Program (see Sources of Funding, below) at a time when the company only did contract research. For its first-round funding, Gemfire secured venture capital. In so doing, it received advice and recruitment help in addition to money. As of the writing of this article, the company was raising a second round of investment.

7. Design the product. Product design is an engineering task. Experienced engineers concentrate on practicalities rather than theory or convenience.

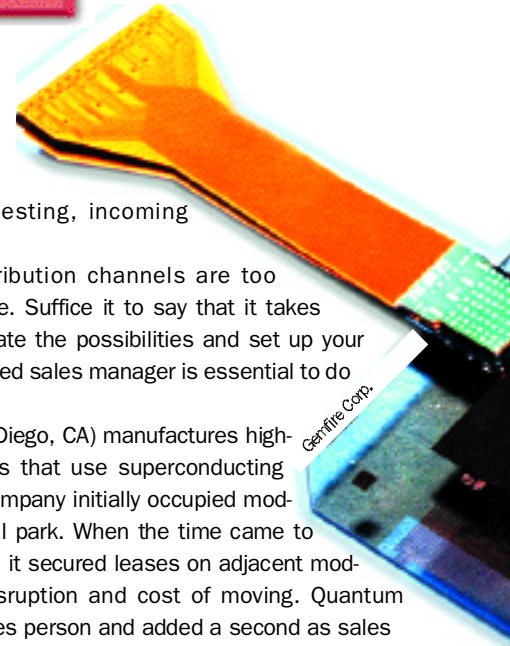
This phase includes more than product design. You need to create a manufacturing process. The product has to be stress tested to ensure that it meets reliability and environmental specifications. An attractive and utilitarian package must be designed. Vendors need to be qualified. And most important, all this has to be documented so the manufacturing department can produce the product with consistency.

The result of this phase is a prototype. It can be used for marketing demonstrations, as a production sample, or for shipment to an "alpha" test customer.

8. Set up sales and manufacturing. Actually, setting up the important functions of

sales and manufacturing should start during the design phase and move forward.

Manufacturing requires floor space, and companies often move to new facilities for this step. New employees are needed to cover activities such as purchasing, invento-



ry control, assembly, testing, incoming inspection, and shipping.

Your choices of distribution channels are too numerous to discuss here. Suffice it to say that it takes time and energy to evaluate the possibilities and set up your organization. An experienced sales manager is essential to do this well.

Quantum Design (San Diego, CA) manufactures high-sensitivity magnetometers that use superconducting SQUID technology. The company initially occupied modular space in an industrial park. When the time came to expand for manufacturing, it secured leases on adjacent modules and avoided the disruption and cost of moving. Quantum Design also hired one sales person and added a second as sales

### SOURCES OF FUNDING

**Yourself.** Put some of your own money into the company, if for no other reason than to demonstrate your dedication to the enterprise. Besides, the more of the company's stock you own in the beginning, the more you will own later when your stake can be quite valuable.

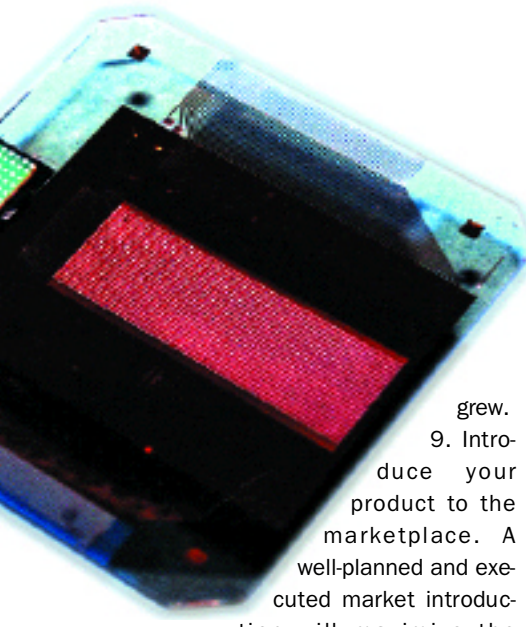
**Family and friends.** Here's the next best thing to investing your own money, in terms of maintaining control.

**Angels.** These are wealthy individuals who allocate a portion of their investment portfolio to high-risk, high-return ventures. Many will treat their investment as an arm's-length relationship, but some are experienced in small-company management and can give you advice and assistance. Recently, angels have begun to organize themselves, at least in California. Their loose organizations provide an opportunity for entrepreneurs to efficiently present business ideas to multiple investors.

**Venture capitalists.** These professional investors pool funds from cash-rich sources such as pension funds and insurance companies and then invest those funds in start-up companies. They generally invest only in businesses with the potential to achieve, say, \$100 million in annual sales. With their business expertise, they can help the entrepreneur, but they are also quite demanding. Most do not make seed investments.

**Corporations.** Many large corporations and some smaller ones have venture arms. They can be excellent funding sources, especially when there is synergy between the new company and the investing company.

**Government grants.** This is an excellent avenue for physics-related start-ups. The Small Business Innovative Research (SBIR) Program, administered through several U.S. government departments, funds a great deal of applied research each year. A start-up company can augment its other funding sources with SBIR contracts related to the new product under development.



grew.

9. Introduce your product to the marketplace. A well-planned and executed market introduction will maximize the

impact of your new product. This process will require an experienced marketing person, a marketing communications agency that is conversant with your market, and 6 to 12 months of preparation.

In making market introductions:

- Time the introduction to make certain that you can deliver the product on time. Product development schedules almost always slip. And no one is more difficult to deal with than a customer whose delivery is unacceptably late.

- Be sure your salespeople are trained before customers start to call them, having heard about the new product from some other source such as your publicity.

- Have your postsales service and customer-support people ready to go before the product's introduction. That first customer is just as deserving of competent, timely service as the many customers to follow.

10. Ship that first product. Now you can start making money instead of just spending it! 📦

## B I O G R A P H Y

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