The Role of Venture Capital: Turning Science into Money

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The following article is based on a presentation by Bill Frezza (Adams Capital Management Inc.) in Symposium X: Frontiers of Materials Research at the 2002 Materials Research Society Spring Meeting in San Francisco on April 2.

Introduction

Materials researchers are proficient at turning money into science. While this is a noble end in itself, reversing the process is occasionally required to keep the cycle going. One way to do this is by creating start-up enterprises that exploit materials science breakthroughs. While risks abound and the failure rate is high, the rewards of success are so hugely disproportionate that human nature can be counted on to provide an ample supply of both talent and capital to fuel the process.

Unfortunately, the venture capital (VC) and materials science communities have historically paid little attention to each other as compared with, for example, the computer science or biotechnology communities. This brief article on the VC industry describes where the money comes from, how it is managed, what the common criteria are for financing start-ups, how the investment "food chain" is structured, and why the applied materials community represents an attractive target for venture capital dollars.

Why the Applied Materials Industry Holds Great Potential

The applied materials community has traditionally been underserved by venture capital (see Figure 1). The frosty investment climate following the dot-com collapse, however, represents an opportunity to refocus resources on industries that offer sustainable values, and applied materials is certainly one of them.

Several factors make materials-based start-ups attractive for VC investments. The long pre-commercial gestation period typical of materials research and development (R&D) facilitates the emergence of clear scientific leaders around which companies can be built. Identifying these leaders is not hard, and the strong tradition of peer review tends to make straightforward the systematic verification of entrepreneurs' claims and plans, a process called due diligence. In addition, it is common practice for researchers to establish intellectual property protection during this protracted development phase, an essential competitive requirement for commercial development. The combination of these factors reduces the risk that copycat start-ups will spread talent and capital across ten times as many emerging companies as a given market could possibly sustain—a sad legacy that has plagued the VC business for most of its 30-year history.

Applied materials businesses usually offer products and services whose economic value to potential customers is easy to quantify based on objective and verifiable metrics. This reduces market risk by supporting a due diligence process that allows prospective customers to assess tangible benefits that they can relate directly to their own financial performance. This can sometimes give start-ups the ability to command premium pricing in what might otherwise be an unattractive commodity market. Intermediate product-development milestones can often be tied to measurable parameters, mitigating the risk of technology failure, an important factor in supporting second- and third-round financing (described in the section on "The Venture Investment Process"). A history of strong manufacturing learning curves once commercialization is achieved and volumes begin to grow helps lift gross margins, provided that care is taken to avoid businesses subject to product substitution and commoditization. Given the disaggregation of R&D and manufacturing in many materials businesses, business models based purely on intellectual property are also possible, offering extremely attractive profit potential as businesses expand. Finally, with the exception of nanotechnology, which is enjoying its 15 minutes of fame, the materials area has been relatively sheltered from the corrosive influence of hype.

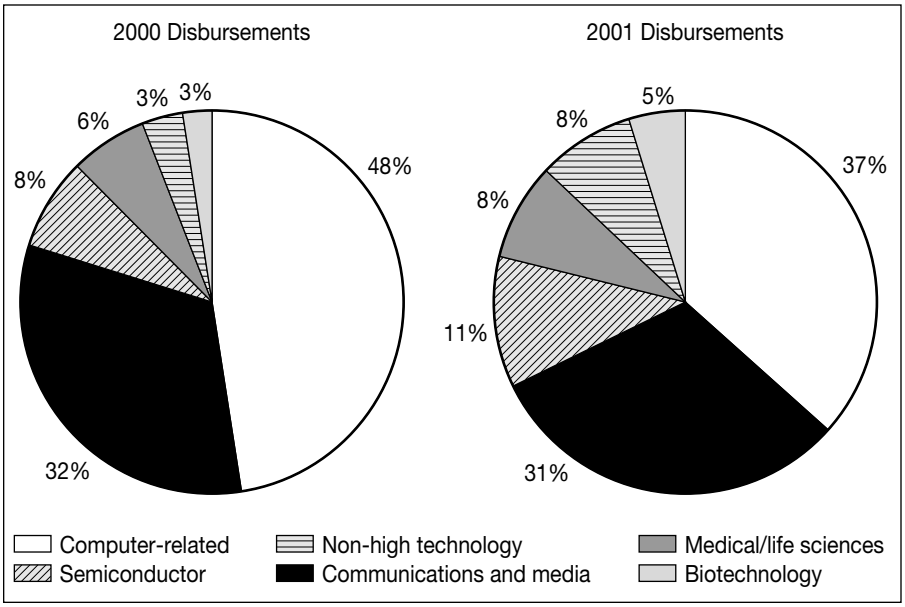

Figure 1. Venture capital disbursements in 2000 and 2001, in the United States.

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A case in point is an investment we made at Adams Capital Management Inc. in late 1999 in an electronic-materials spin-out from the Massachusetts Institute of Technology (MIT) called AmberWave Systems (www.amberwave.com). We had been searching for investment opportunities generated by the expected end of the "silicon roadmap" and came across Eugene Fitzgerald, an MIT professor who had spent the prior 15 years investigating enhanced electron mobility in strained silicon. We were attracted by the extent to which this new material technology could leverage the billions of dollars of prior investment in complementary metal oxide semiconductor (CMOS) design and manufacturing facilities, as well as the strong patent position Fitzgerald had established. Starting with a modest $600,000 seed investment, we helped Fitzgerald and his lead graduate student, Mayank Bulsara, structure the business, working with MIT's technology licensing office to obtain an exclusive license on the core patents. That done, we helped recruit an experienced CEO, coached the team through the writing of a business plan, and led the first institutional venture round, committing $7 million out of a total round of $20 million. This first-round money allowed the company to build a Class-10 and a Class-100 clean room capable of R&D-scale wafer fabrication, hire the technical staff required to transfer the technology into commercial production, develop an extremely broad patent position, and secure an anchor licensing and development agreement with a major microprocessor manufacturer. A second round of financing 15 months later brought in an additional $25 million to expand the business, with commercial production of the first strained-silicon chips expected by AmberWave's licensees in early 2003. While Fitzgerald has acted as chair and technology visionary for the company from the outset, using his sabbatical year to launch the business, he continues to serve full-time on the faculty of MIT.

The Structure of Venture Capital Partnerships

A look behind the scenes might help potential entrepreneurs better understand the strengths, limitations, and motivations of prospective investors. VC partnerships are typically structured as closed-end, ten-year funds chartered with investing in private equities, that is, stock in young, growth companies that are not yet publicly traded. Limited partners (LPs) are passive investors who provide the bulk of the money, while general partners (GPs) actively manage the investments. LPs typically include university endowments, pension funds, and insurance companies, as well as family trusts and wealthy individuals. LPs do not typically play an active role in making investment decisions or managing portfolio companies, although they do sometimes introduce promising opportunities that can be investigated by the GPs.

The LP community classifies VC partnerships as alternative investments in order to differentiate them from the broad and largely public stock and bond holdings that make up the bulk of an LP's investment portfolio. LPs pledge a fixed amount of capital to a VC fund at the outset or *closing*. Money is then drawn down over the life of the fund as investments are made in proportion to each LP's commitment. The size of a VC fund is the total amount of capital committed by the LPs in a particular partnership. After the initial investments are made, new LP investors are generally not accepted, although partnership interests can sometimes change hands through an informal secondary market.

The GPs are responsible for organizing the fund, raising capital commitments from LPs, investing the money in start-up companies, and then working directly with entrepreneurs on their companies' boards of directors to manage these investments through to liquidity. When that happy day arrives, and liquidity in a given deal is achieved, either subsequent to an initial public offering or by means of acquisition by a publicly traded company, the proceeds are shared with the LPs according to a prearranged formula. Typically, LPs put up 99% of the capital and receive 80% of the gains after their initial investment is returned. GPs put up 1% of the capital and receive 20% of the gains. In addition, GPs receive a management fee that is used to finance operations, such as paying the salaries of the GPs and support staff. Annual management fees typically range between 2% and 2.5% of committed capital during the early years of a fund, trailing off in later years.

In bull markets, when the active pool of LP investors expands, both the size of individual funds and the total number of VC firms can expand dramatically (see Figure 2). Staying in the business by raising a new fund every three years or so, as is customary for most VC firms, requires beating both the public stock market and competitive VC funds. This is harder than it looks, particularly across good times and bad. The size and number of VC firms exploded during the dot-com bubble and is likely to contract significantly in the aftermath, as performance returns to historical norms (see Figure 3) and disappointed LPs retreat from the field.

Although each fund lasts for ten years, the typical cycle involves investments in new companies during the first three years, follow-on investments in those same companies as they grow over the next three years, and the harvesting of the returns and the winding-up or liquidation of failing enterprises over the remaining years. VC firms can typically raise a new fund when 85% of their prior

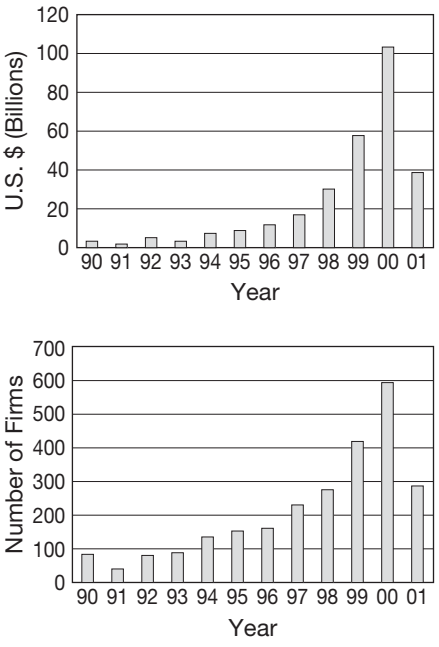

Figure 2. (top) Total limited-partner commitments to venture capital per year, 1990–2001, in the United States; (bottom) number of venture capital firms raising capital, 1990–2001, in the United States. Source: Thomson Financial; data through December 31, 2001.

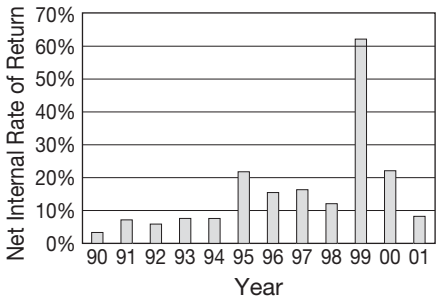

Figure 3. Cumulative internal rate of return of all venture capital funds, weighted by the average size of each financing, 1990–2001, United States. Source: Thomson Financial; data through September 30, 2001.

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funds are committed, including both investments and reserves, so a firm may have as many as three or four funds active at a single time, each in a different stage of maturity.

Funds are comparatively evaluated by their *vintage year*, the year in which the fund was closed, and are classified by their *stage*, based on whether initial investments are focused on early, middle, or late-stage start-ups. Like wine, underlying performance tends to vary with the general state of the environment. Both strong and weak funds do better in good years, so partnership returns are best compared by looking at identical investment periods. Risk/return ratios also tend to vary with the stage in which VC funds concentrate their investments, early being riskier than late while carrying the potential for higher returns, although some partnerships are diversified by stage, which tends to blur the comparisons.

The Venture Investment Process

The private equity "food chain" comprises several stages, each of which boasts its own specialists. *Seed money* generally consists of initial investments of less than a million dollars. It often comes from the entrepreneurs themselves (which always warms a venture capitalist's heart), friends and family, "angels," optimistic suppliers hoping to cultivate future customers, and numerous government agencies, including, in the United States, the National Aeronautics and Space Administration, the National Science Foundation, the Defense Advanced Research Projects Agency, and the Small Business Innovation Research program. The latter group is particularly attractive as a source of funds because investments are *nondilutive*, that is, founders do not have to give up stock in their companies. Working with an experienced angel, particularly one who has been through the whole cycle as an entrepreneur, can often pay off due to the quality of advice, contacts, and assistance that comes along with the cash.

First-round money generally refers to the initial institutional venture round in which the VC firms make an investment of multiple millions of dollars. A start-up seeking first-round funding is typically not yet producing revenue, although it may have a product prototype nearing completion or being tested by prospective customers. Often the management team is incomplete, with key skill positions waiting to be filled. Good first-round venture capitalists play an active role on the board of directors, helping entrepreneurs round out the management team, define and expand the product roadmap, obtain the endorsement of corporate partners, attract the attention of industry analysts, and implement various best practices such as the construction of employee stock option plans, cash management policies, and capital equipment lease arrangements.

What should entrepreneurs look for in first-round financing? This varies based on the type of business and level of experience of the founding team. In general, it helps to have venture capitalists with relevant domain knowledge, a GP that can spend adequate time with the company, and a fund that can allocate substantial reserves to participate in follow-on rounds. The latter can be crucial to maintaining successive step-ups in the value of a company's stock through the venture process, as nothing is more vulnerable than a start-up company out of cash whose existing investors are unable or unwilling to participate in subsequent rounds. Personal chemistry between company founders and VC investors is also important, given the level of control that is usually ceded to as part of the process.

Second-round money generally refers to a subsequent multimillion-dollar financing that is used to fund growth after customer revenue starts to flow. Second-round investors expect that many of the fundamental risk items have been resolved and, hence, are usually willing to pay a higher price than earlier investors. The management team should be substantially complete, initial revenue should be coming in according to plan, gross margins should be heading toward that magic 65%, and the fundamental value proposition of the product—that is, the tangible economic benefit provided to customers—should be verifiable through customer interviews. The company should have established its competitive positioning, which helps in setting valuations by comparison with comparable companies, and educated one or more key industry analysts who can talk knowledgeably about the company's prospects.

Additional financing beyond the second round can take many forms, but if all is going well, the company should be near profitability and should be actively planning for some sort of liquidity event. If things are not going well, life can get very exciting for all concerned, particularly if circumstances force the company to take a *down round*, that is, an investment at a lower price than prior rounds. Late-stage investors, who tend to manage larger funds that often invest in both private and public equities, pursue many different strategies, although they often take a more passive role in their portfolio companies.

The Venture Capitalist/ Entrepreneur Courtship Dance

What do early-stage venture capitalists look for in a deal? It varies from partnership to partnership, but attractive qualities include (1) a strong economic value proposition (who are the potential customers and why are they going to pay enough to support 65% gross margins?); (2) an experienced management team, including people in key skill positions who have done it before; (3) a large and growing addressable market; (4) a well thought-out product roadmap that extends beyond the initial product or service; and (5) a unique and defensible business—but not too unique (there are two bad answers to the question "How many competitors do you have?"—100 and zero). Very few start-ups possess all of these qualities, which is what makes the venture business so interesting. Different VC firms are willing and able to manage different kinds of risks, so it is important for entrepreneurs to match their needs with the skills and capabilities of their investors. The big three risk areas to be considered are (1) technology risk—the risk that the promising science can never be successfully embodied in a workable product; (2) market risk—the risk that even if the product works as planned, no one will buy it; and (3) management team risk—the risk that inexperienced executives will fail to competently execute the business plan.

How do you know when you are ready to raise venture capital? The broad rule-of-thumb is two or fewer years to revenue, four or fewer years to profits, clear intermediate milestones that can support follow-on fundraising, potential exit valuations at the time of the initial public offering (IPO) or acquisition in excess of $100 million as measured by comparable businesses in the same sector, and a plausible chance of giving first-round investors a 10× return on their money. A 10× return may sound rapacious, but consider the high failure rate of early-stage companies. Disproportionate rewards are the key to attracting high-risk money.

Be aware that when you accept an investment from a venture capitalist, you are largely giving up control of your company, regardless of the percentage of the company's stock the venture capitalist buys or the number of board seats investors hold. This is because venture investments are generally structured around *preferred stock*, while founders and employees hold much less powerful *common stock*. Preferred stock can come with pages of customized protective provisions

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giving venture capitalists veto power over the key operating parameters of the business. These include the ability to raise more money, changing the size and composition of the board, taking on debt, and expanding the employee option pool, for example. Giving up this kind of control requires both good goal congruence and a strong relationship of trust between entrepreneurs and investors. Taking on VC is more like hiring a partner than borrowing money from a bank.

In general, venture capitalists look at hundreds of business plans for every one that they finance, so getting their attention is an exercise in itself. Entrepreneurs should cultivate a network of contacts that can provide introductions; unsolicited business plans generally get short shrift. Start early and be prepared to be turned down many times before you get a nibble. Do your homework and understand the strategy and prior investments of a target venture capitalist before you make your approach. The Web has made this a simple process—do not skip it—and be prepared to explain why you fit a particular investor's strategy. Develop a compelling *elevator speech* that describes the key merits of your business idea in less than 60 seconds, and then listen to feedback from potential investors who turn you down on how you can improve both your story and your business. Make yourself easy to diligence by preparing in advance a list of potential customer references, technology references, market analyst references, and management team references. And remember, it takes two deals to get one. Individuals do not negotiate against themselves, so try to develop several independent groups of potential investors and be careful not to let them communicate with each other, as collusion in the VC business is a way of life. (It generally goes by the kinder, gentler name of *syndication*.)

And most of all, have fun. Win, lose, or draw, there are few things you can do in your career more exciting than mixing the wonders of science with the adrenalin of launching a start-up.

Traps & Tips

Here are some traps to avoid and a few simple tips for prospective entrepreneurs seeking venture capital financing.

Traps to Avoid

- Don't forget that technology is a means to an end, not an end in itself.
- Don't take shortcuts on intellectual property protection. Do it right the first time.
- Don't give away the store to deal brokers or agents who promise to find you funding.
- Don't underestimate the value of a partner who is as good at business as you are at science.
- Don't forget to check references on everyone you do business with.
- Don't expect investors to understand everything you are saying on the first pass.
- Don't expect venture capitalists to sign nondisclosure agreements before you describe your idea.
- Don't spam your business plan to laundry lists of venture capitalists.
- Don't confuse an analyst or associate at a venture capital firm with a decision-making partner or principal.
- Don't get fixated on particular job titles or roles in the start-up organization.
- Don't get fixated on a particular valuation for your company. The market will tell you that.
- Don't let potential investors collude to drive the price down. Keep the investor conversations separate.
- Don't fail to disclose known risks or shortcomings; these will only come back to bite you.
- Don't turn down larger amounts of money than you set out to raise. You will need more than you think.
- Don't get discouraged, but be realistic if your time has not yet come.

Tips

- Develop a crisp articulation of the economic value your product or service provides to prospective customers.
- Develop a quantitative estimate of the total dollar value of the market you hope to serve.
- Develop a clear understanding of your competitive advantages with respect to alternative suppliers.
- Structure your fundraising plan around achieving specific milestones that reduce the risks for next-stage investors.
- Lay out a potential timeline from initial revenue through profitability and exit via an acquisition or initial public offering.
- Understand all the resources—money, people, and partners—required to get there.
- Prepare a three-page executive summary of your business plan.
- Hone a short speech describing the key merits of your business that you can deliver within the duration of an elevator ride.
- Network extensively to gain personal introductions to potential investors.
- Make yourself and your business plan easy to assess by prospective investors by preparing customer, industry expert, and personal references.
- Seek the counsel of experienced advisors and entrepreneurs who have done it before.
- Use the Web to identify venture capitalists who are a good match for your business (try www.nvca.org).
- Identify the particular partner at a firm you would like to pitch your idea to, then study his or her prior investments.
- Remember that it takes two deals to get one. Individuals do not negotiate against themselves.
- LISTEN, LISTEN, LISTEN to feedback.
- Be prepared to kiss a lot of frogs before you find that prince.

Bill Frezza *joined Adams Capital Management Inc., a national venture capital firm, in 1997 as a general partner. Located in Cambridge, Mass., his area of domain expertise includes semiconductor and applied materials, broad-band communications, and local access networks. Prior to his work at Adams Capital, Frezza was founder and president of Wireless Computing Associates, providing technology strategy and consulting services to major vendors in the telecommunications industry. Frezza served as the director of marketing and business development for Ericsson Inc.'s wireless data division and has extensive engineering and product management experience from General Instrument Corp. and Bell Laboratories. He has also been involved in several start-up ventures, holds seven patents, and was a columnist for* InternetWeek. *He has two BS degrees (biology and electrical engineering) and an MS degree (electrical engineering) from the Massachusetts Institute of Technology. He is a board member of AmberWave Systems Corp., InfoLibria Inc., and VBrick Systems Inc. Frezza can be reached at waf@acm.com. The Adams Capital Web site URL is www.acm.com.*

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