BioBlood

M&A in the Biotech World

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Introduction

William O'Brien, Alewife Sciences' Vice President of Business Development, hung up the phone and took a deep breath. He had just been told by Dr. Jonathon Masters, founder and president of BioBlood, that the meeting with shareholders was not going well. In fact, Dr. Masters was about ready to throw in the towel. Before doing that, he wanted to know if William had any flexibility in his offer to acquire the company.

O'Brien's offer was based on his valuation of the company. Although O'Brien was aware that different valuation methodologies could be used he believed, based on his experience, that the best approach was the traditional discounted cash flow model. The DCF approach enabled him to consider the company's operating profit and the capital required to grow if Alewife Sciences decided to do the acquisition. For his own part, Dr. Masters wanted to get out from under his investors. Like many small businesses, Dr. Masters had taken startup capital from private investors who were not professional investors and expected Google-type returns from all of their high-tech investments. Now, these very investors were rejecting O'Brien's offer. Dr. Masters needed something more to get them to say yes.

O'Brien, 46 years old, had worked in the investment arena for many years. After earning his law and MBA degrees, he worked with a prestigious law firm handling technology deals in the New England (U.S.) region. In 1988, he went to work for Alewife Sciences, a U.S. company. He became Vice President, Corporate Development in 1994 and was responsible for overseeing their business development initiatives on a worldwide basis. He had concluded a successful string of acquisitions. He enjoyed the excitement of making acquisitions. His approach to buying and managing businesses was to place an emphasis on cashflow, the "Warren Buffet" model as applied to the pharmaceutical industry, rather than other valuation methods that he believed were not appropriate given the uncertainties in the business, changing industry dynamics, and the type of companies that Alewife Sciences targeted, *i.e.* companies in need of cash, management, and infrastructure to scale to grow

[1] Please contact Marc Meyer, (mhm@neu.edu) for the teaching note for this case. Additionally, we have prepared an Excel spreadsheet to help students work the details of the financial analysis and company valuation.

significant value. O'Brien's goal was to find small operating companies that not only had successful technologies, but also, had proved a business model, *e.g.* they had figured out how to make attractive levels of profit on sales. Further, O'Brien wanted to find companies for whom capital infusions, and Alewife's own distribution channel were the key to scaling up. This approach was in stark contrast to the approach used by many of O'Brien's peers in the biotech venture world who focused purely on the market potential of new technologies.

But now on this cold February day in 2005, O'Brien might have hit a dead end with BioBlood. All the potential for synergy, growth, and operating profit was there, but he had to get Masters to get his investor group to agree to a package.

Alewife Labs

Alewife Labs (Alewife) was founded fifty years ago by a young veterinary school graduate to breed laboratory animals used for pharmaceutical research. By 2005, it operated more than thirty production facilities, some of which were overseas. From these facilities, the company produced animals used in biomedical research, consumer product safety testing, and animal health care. Alewife also produced biological raw materials for human therapeutic applications.

The company's focus was to expand across the full value-chain of drug discovery services, helping pharmaceutical companies to develop and test new drugs at all stages of development. Traditionally, the company's "core" business was the production of genetically defined and specific pathogen free (or "clean") rats and mice for laboratory research. Alewife grew rapidly in the 1960s and 1970s. During the 1980s, the company diversified into new product lines in the biotechnology and biomedical fields, including production of monoclonal antibodies for therapeutic purposes, animal organs for human transplantation, and embryo cryopreservation for human and animal fertility applications. Despite this incremental broadening of the product portfolio, the company still derived more than 80 percent of its revenues from the sale of laboratory animals.

Alewife's core business had been declining in unit volumes in the range of 1–2 percent per year for the last several years. The industry had undertaken systematic efforts to reduce unnecessary or duplicative animal tests. Mergers in the pharmaceutical industry had consolidated R&D labs - meaning fewer customers - and there was increased pressure on pharmaceutical companies to keep prices under control. Because pharmaceutical companies were being pressured to limit their drug price increases, they, in turn, pressured suppliers such as Alewife to limit their own price increases.

Alewife had been a financial success throughout its fifty-year history. (Its recent financials are shown in Exhibit 1.) Alewife had consistently maintained operating margins at or near 18 percent and had grown in both sales and earnings on an historical average basis of 15 percent to 20 percent per year. It achieved price to earnings ratios ranging from a low of 20 to a high of 60 during the 1980s. During the 1990s, however, Alewife found it harder to achieve the 15 to 20 percent growth in earnings in the laboratory animal business and now was focused on diversification into new but closely related areas. Alewife wanted to acquire companies with outstanding technology to which they could add management expertise, money, marketing know-how and sales-force infrastructure. As important as anything, Alewife wanted to find companies that were twice as profitable on an operating basis as its own core business - with 36 percent operating margins as opposed to 18

percent. Operating margins in the range of 36 percent would, O'Brien knew, provide sufficient cushion against some of the risks associated with acquisitions and further increase Alewife's average operating margins.

The LAS Assay

One method William O'Brien used for seeking out potential acquisition targets was to look for technologies that could have an impact on the use of animal tests. One such technology was an *in vitro* technique known as the LAS assay, a specialized reagent used to test for the presence of certain diseases. The LAS (Limulus Amebocyte Lysate) assay had already been recognized by US regulatory authorities as a fully acceptable *in vitro* alternative to the use of a whole animal.

LAS was based on endotoxin. Endotoxin was a component of the cell wall of gram-negative bacteria.[2] It was found almost everywhere in nature, especially in water. Also known as a "pyrogen" for its fever producing effect, endotoxin was generally harmless to humans except when it entered the blood stream. At levels as small as a few hundred nanograms, endotoxins could cause fever, shock, hemorrhage, and ultimately death. For this reason, medicines, fluids, and medical equipment, which were used in intravenous therapy, needed to be free of endotoxin contamination.

The rabbit fever test, developed in the 1940s, was the standard test for endotoxins until the approval of the LAS test by the FDA in the 1980s. In the rabbit test, healthy rabbits were injected intravenously with a sample of drugs or with a wash from a medical device. Then the temperature of the rabbits was monitored for three hours. If a one-degree or greater rise in temperature was observed, the product was considered pyrogenic. As many as one million rabbit tests were performed annually prior to US regulatory acceptance of the LAS alternative.

In the 1960s, a university-based pathologist observed a large number of horseshoe crabs dying on a beach on the northeast coast of the US. He found that their blood was clotted and that they were infected by gram-negative bacteria. A hematologist colleague of the pathologist also studied the crabs' disease because it mimicked the course of human infection. The hematologist's research showed that the blood cells of the horseshoe crab were responsible for the clotting, and that endotoxin from the gram-negative bacteria was the cause. From these blood cells, the hematologist developed a test reagent and began research on testing for endotoxins in patients with serious infections. He named this reagent LAS.

As the merits of the LAS test were identified and expanded, the FDA and the pharmaceutical industry began to develop standards and regulations to allow widespread use. The drug companies began providing multi-million dollar orders to suppliers in the early 1980s. In December 1987, the FDA issued guidelines outlining the steps necessary to obtain approval for LAS use in lieu of the rabbit fever test for release testing of drugs and medical devices.[3]

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[2] Gram-negative bacteria are those that do not retain crystal violet dye in the Gram staining protocol, which is a common diagnostic method in the life sciences. Gram-positive bacteria, on one hand, will retain the dark blue dye after an alcohol wash. In a Gram stain test, a counterstain is added after the crystal violet, coloring all Gram-negative bacteria a pinkish color. The test itself is useful in classifying two distinctly different types of bacteria based on structural differences in their cell walls. The reason why this classification is important is that many types of Gram-negative bacteria are pathogenic, causing disease, and endotoxins are one of the more common, and harmful, components of Gram-negative cell walls. Endotoxin triggers a response in the immune system which begins the inflammation in tissues and blood vessels.

[3] Under these federal guidelines, the FDA's Center for Biologics Evaluation and Review (CBER) must first test and release each lot of commercial LAS prior to sale by the original manufacturer.

The Market

William recognized the potential threat of the LAS assay, but he also wanted to investigate its potential opportunity. He found that the estimated market for the LAS reagent and related test materials to detect endotoxins was approximately $200 million in 2005 and was expected to double over the next five years.

The end-users of LAS tests were comprised principally of drug manufacturers, biotech companies and medical device manufacturers. In excess of 90 percent of all LAS applications were for "fever" or pyrogenecity testing of FDA-approved, injectable human drugs. The US market was estimated to comprise 60 percent of the total market for LAS products. The European and Japanese markets were estimated to be 40 percent of the total, with the highest rate of growth expected in the near-term in Western Europe. Emerging pharmaceutical research in regions such as India, China, and Russia were also expected to contribute to market growth for LAS in the years ahead. In fact, industry observers expected the LAS business to grow at 15 percent a year, the rate realized since the FDA approval of the LAS test in December 1987.

The industry was highly profitable, with the three leading LAS manufacturers maintaining estimated operating margins of approximately 30 percent. The market was sensitive to quality, service and price, in descending order of importance.

The biotech industry was expected to use more LAS testing, as nearly all-existing and anticipated biotech products were administered by injection. The veterinary LAS testing industry was also expected to experience substantial growth, as veterinary pharmaceutical companies increased their LAS testing activity in response to new regulations. In addition, regulatory changes impacting manufacturing process quality testing were expected to increase the level of raw materials testing. The opportunity in new markets and for new applications equaled or exceeded the current market for existing applications. When O'Brien looked at these numbers, he knew that LAS was an area in which participation by his own company should be seriously considered.

LAS Suppliers

William considered the market to be interesting and started to sort out which company might be the best acquisition target. There were four major companies in the LAS industry, one of which was BioBlood. The other three were:

- *MarineBio:* a privately held firm U.S. founded in 1977. This company was the historical market leader with 2005 sales estimated at $67 million. This represented a 45 percent share of the commercially-supplied market *(i.e.,* excluding in-house production by biotech and pharmaceutical companies). The company had lost market share to its competition in the last few years due to product quality problems and service deficiencies. It nevertheless continued to enjoy a high level of brand recognition throughout the world. The firm had not significantly increased the price of its products over the past five years in an attempt to avoid further market share deterioration.
- *Endotox:* a division of a publicly held company, also headquartered in the U.S. The company's LAS operation had grown rapidly in recent years, principally at the expense of MarineBio with LAS revenues standing at about $60 million in annual

sales, a 40 percent market share. The company had used extensive marketing and a large direct sales force to grow. Its products were known for good overall quality in the high-end segment and held a significant price premium.

- *BioDetect:* a privately held firm with less than $6 million in sales despite a long operating history, this U.S. company competed primarily on price and provided only limited technical service.

About twenty companies had tried to enter the LAS industry since 1980 without success. The technical "know-how", the specificity of customer needs, and the rigors of the FDA approval process had proven strong barriers to entry.

BioBlood

William O'Brien began scouting out MarineBio and BioDetect as potential acquisitions to enter the business. His standard practice was to find customers of his own company that were also using the products of a potential acquiree, and to find out the strengths and weakness of those products and the companies behind them from the eyes of the customer. As he was doing this for endotoxin testing products, several Alewife customers mentioned that there was this other player in the market, BioBlood, a small privately held company in the Southeastern U.S. that had great technology.

O'Brien's initial inquiries found that in contrast to the other three companies BioBlood was growing, had proprietary technology, and seemed to be generating operating profits even at its small size. He learned that Dr. Masters had worked with LAS reagents since 1974 as a university professor but did not start BioBlood until 1993. The innovation in LAS technology he had developed was a proprietary method of chemically formulating the gel clot reagent to a variety of sensitivities as determined by customers' specific requirements. This allowed the reagent to achieve compatibility across a broad range of tested products, along with a consistent and unequivocal low end point at all levels of sensitivity. Dr. Masters held several patents on his chemical formulation process. His approach minimized interference with test results from the product being tested. This resistance to interference was a key competitive advantage. The BioBlood reagent had also gained recognition for its performance in terms of reliability, ease of use, extended bench stability, clot firmness (leading to easier, more objective interpretation), and conformance to label claims for shelf life.

BioBlood's mission was to offer the most interference resistant, reliable, and stable pyrogen test for pharmaceutical LAS testing. The FDA first approved BioBlood's production facility and gel clot product at the beginning of the 1990s.

BioBlood had slowly increased its sales in the years following FDA approval. By the end of 2004, more than two-thirds of its existing business was the result of conversions of customers from one of the two market leaders, and sales had reached almost $3.6 million. BioBlood made its first profit in 2002. Dr. Masters had hired an operating manager into the company several years early, and with that hire, came greater financial discipline to build a profitable, albeit small business. (See Exhibit 2 for BioBlood's recent financial statements.) For O'Brien, the company warranted the next level of investigation.

Due Diligence

O'Brien phoned Dr. Masters in June 2004 and floated the idea of Alewife purchasing BioBlood. He told Dr. Masters that he had done some checking on the company and that he found that Dr. Masters had a very good reputation. He told Dr. Masters that he would like to get to know him and his team further by visiting the company. He also warned Masters that he intended to perform due diligence by visiting the company's competitors to validate BioBlood's proclaimed advantages, by having a technical expert assess the quality of BioBlood's technology, by speaking to BioBlood's customers in an extensive manner. Eventually, he would also have to examine BioBlood's financial statements.

Before starting these efforts, however, he wanted to find out whether Masters was willing to stay with the company if acquired and to work hard to make it grow as a business unit within Alewife. O'Brien explained the concept of an earn-out deal:

> We like senior management of newly acquired companies to have an incentive to really grow the top and bottom lines. We want them to be investing all of their time and energy into taking their company to the next level. We think they should be rewarded for a real breakthrough level of growth. For this reason, we can incorporate earn-outs in any deal.

Dr. Master's had never heard of an earn out before, so he asked O'Brien for an example. O'Brien responded:

> The structure of an earn out might be, for example, that we project forward for five years the sales based on your current annual sales growth rate. If the business achieves beyond those projections, say over the next five years, we will provide a percentage of the up-side directly to you as a bonus. In one of our acquired companies, the annual growth rate was 25 percent year by year, and we decided to give the founder 5 percent of sales above those projections as a bonus. He did very well. In fact, he had so many shareholders by the time he sold the business to us that he really didn't own that much stock. That earn out is where he is going to make most of his money. Plus, he is getting the satisfaction of watching his company become a world-class business.

Dr. Masters said he was interested and they arranged a visit by O'Brien in several weeks. What O'Brien found was that BioBlood was indeed a profitable company. It had both a working product and a viable business model. The company had net margins close to 37 percent on $3.6 million in sales, for a net profit before tax of $1.19 million dollars.

O'Brien also learned that Masters had made some classic mistakes in raising money, mistakes that would limit the growth of BioBlood. Simply put, Masters had lost control of the stock by giving it out too freely. Further, Masters might be generating over a million dollars of profit now, but he had lost use of half that cash because he had promised the investors to pay the half of operating profit back out to investors as either interest or dividends.

To start the company, Masters first used nearly all of his family's savings, $60,000. He later turned to neighbors and professional acquaintances for additional money. Masters raised another $500,000 by word of mouth in his hometown through a network of lawyers and bankers. Because LAS was regulated by the FDA as a "drug", BioBlood had required nearly

three years of start-up time to acquire the necessary FDA licenses and permits. During this period, the company had no incoming cash and was unable to obtain a bank loan. There had been no interest on the part of the venture capital community, as the market opportunity then seemed rather limited. Besides, Masters had never run a business before, nor did he work with lawyers and accountants with experience and sophistication in venture investing.

Masters had been careful to keep his payroll and expenses as low as possible during the start-up phase. By the close of 2004, the company had only 15 full-time employees. He had periodically enlisted the help of consultants and other professionals to solve operational problems. Having no cash, he had offered them instead a "piece of the company". BioBlood's investor group eventually grew to sixteen. Combining the shares paid in lieu of cash and the investors' shares, Masters ended up owning only 28 percent of the stock and the other investors 72 percent.

Not only had Masters lost control of the company, he had also boxed himself in with cash payouts. The total amount of capital raised from the investors was $500,000 in loans and equity. The typical shareholder of BioBlood invested $50,000 in the company with 90 percent of that amount structured as a loan with a higher than bank interest rate. The remaining 10 percent was structured as equity, at a low startup valuation level. Masters' deal with the investors was that once profits were achieved and retained earnings were positive, he would provide half of after-tax earnings to them and keep half of the earnings to reinvest in the business. He also had to pay back interest on the loan amounts to investors. All told, these consumed more than half of his operating profit in 2004. He had paid $670,000 to investors that year! He desperately needed that money to grow the business, but the investors were not willing to change the deal. More than several were lawyers and threatened legal action if Masters changed the deal.

BioBlood might continue to grow without raising outside money, but it would at a much slower rate than would be possible with a million-plus dollars invested every year into sales, manufacturing, and service.

O'Brien's overtures seemed a way out of this dilemma. While Masters was BioBlood's largest shareholder, he had no effective control. His hands would be forever tied. Plus, it was clear that Alewife called on many of the same customers that BioBlood wanted to reach. A deal with Alewife would clearly accelerate his own sales efforts.

Valuing the Company

O'Brien began to work on a valuation for BioBlood so that he could put together an offer. He understood that the three primary methods for valuing closely-held companies were the market approach, the income approach (DCF), and the asset approach. He quickly reviewed some notes that he had regarding these approaches (Exhibit 5).

Most of O'Brien's peers used the market approach or the asset approach, valuation methods based on some combination of multiples of sales and multiples of earnings, and benchmarked these against comparable acquisitions in recent months. O'Brien knew that the market approach using multiples on sales and earnings was a simpler and more common valuation technique. Small technology firms in life sciences (defined by analysts as having sales under $50 million, 15 percent sales growth, and at least 10 percent operating margins) were being acquired for 7 to 10 times trailing EBITDA (earnings before income taxes, depreciation, and amortization). This would put BioBlood's valuation at about $13.5 million. Other companies were being acquired on the basis of a multiple of sales, about 4-times sales. For BioBlood, this would yield a $14 million price. Alewife also had internal "comps" as benchmarks. The year before it had completed two acquisitions of privately held companies, one at 6.5 times EBITDA (a vaccine materials company) and the second at 7 times EBITDA (a medical instruments company).

O'Brien, however, preferred to use the income approach, *i.e.* to calculate the net present value of discounted cash flows because he wanted to see the cash generated by sales growth as well as factor in the capital investments needed to expand the business. This also meant that he had to determine the terminal value of the business - the value of the cash-flow generated by the business in perpetuity.

O'Brien created a discounted cash flow (DCF) model as a baseline to run scenarios. He developed a DCF computer spreadsheet model using BioBlood's historical unaudited financial statements. (Exhibit 3 shows a back of the envelop template that O'Brien used. That exhibit also provides a step-by-step process for working through the template.)

BioBlood had sales of $3.6 million in 2004 and operating margins of about 37 percent. He agreed with Masters that BioBlood could grow to $10-15 million a year over the next 4-5 years, or at about an annual rate of about 30 percent. He felt that its profitability should continue in the 37 percent pre-tax net income range. Now that the company had turned profitable, however, it would need to begin paying taxes. O'Brien assumed a 40 percent tax rate for BioBlood - the same rate that Alewife had been paying. He also felt that BioBlood would need a substantial infusion of cash, $250,000 a year over the next five years for new plant and equipment.

In addition to operating income derived from the future growth of the business, O'Brien also wanted to factor in changes to cash position based on increases in three specific items: accounts receivable, accounts payable, and inventory. (Exhibit 4 lists O'Brien's assumptions in these areas.)

To compute net present value, O'Brien decided to use Alewife's own weighted average cost of capital, which at that time was running at 10.9 percent.

It was important to O'Brien to keep the projections of revenue conservative for several reasons. First, he did want to overpay for BioBlood. Second, and equally important, was that those same spreadsheet projections used for valuation would serve as the going forward business plan for the new division. Further, if Alewife included an earn out, Masters' bonuses would be based on the projected numbers. Too high, and Masters might not receive any bonus. In fact, part of O'Brien's own compensation package was based not only on buying companies, but on their trailing financial performance for three years. His own management thought that this approach would ensure that O'Brien created realistic growth plans for acquired companies. As he said to Masters:

> We need to be careful here, since our valuation in the acquisition will surely end up as our business plan for the following year once we run the business. That's the Board's way of ensuring that we believe in the valuation, tying our bonuses to achieving the assumptions in the valuation.

O'Brien also visited some of BioBlood's lead investors. He felt that they had to know that Masters was himself frustrated and that Masters' energy and enthusiasm for the business was bound to decline over time. Yet, they seemed content to milk the profits from the business and didn't really understand that this was limiting the company's growth. O'Brien sensed that Masters would have to play hardball with his own investors. He had to tell them if they didn't take a reasonable deal he would leave the business and let them figure out what to do with it. Getting the kind and earnest Dr. Masters to do this would be no easy matter.

The Decision

O'Brien had decided to offer a total package of $7.5 million for BioBlood. The package consisted of a $500,000 in cash and $7,000,000 worth of Alewife stock. Alewife would also pay off some $200,000 of BioBlood's debt. This would remove a lien on Masters' house that he had taken to obtain working capital from a bank a few years earlier.

O'Brien thought that the $7,500,000 represented a handsome return for the early investors. Already, 2005 was looking to be a tough year for small biotech firms that had taken venture capital and had trouble getting more.

Masters' phone call indicated the opposite. Some of his shareholders held the fantasy of the next Google. Those that were more realistic were still looking at a multiple of sales and wanted a valuation twice the size of the Alewife offer.

O'Brien had also structured the deal to be the cash and stock for the assets of BioBlood, as opposed to a merger of the companies. This meant that the shareholders would still be held liable for lawsuits from prior business operations. Since some of BioBlood's shareholders were lawyers, this was proving to be a heated point of contention, even though the firm had never been sued.

What should O'Brien do? Should he increase the valuation of BioBlood? Large pharmaceutical companies were beginning to suffer from blockbuster drugs coming off patent, shedding their own research staffs, and turning to small biotech firms to rebuild the pipeline of new drug applications.

Should O'Brien change the stock for assets nature of the deal? Should he try an earn out for Masters? If he did, did he have to tell the other shareholders about the earn out? And perhaps most important, should he set a date for the investors to either fish or cut bait? O'Brien himself had other fish to fry -he was looking at about a half dozen other companies in other categories equally important to Alewife Sciences.

Income Statements (in thousands)

	2003	2004
Revenue	$ 99,300,000	$ 102,800,000
Cost of Sales	69,300,000	72,000,000
Gross Margin	**$ 30,000,000**	**$ 30,800,000**
SG&A	$ 12,400,000	$ 12,700,000
Operating (Loss)/Income	$ 17,600,000	$ 18,100,000

Exhibit 1 Alewife's Income Statement 2003, 2004

Income Statement

	2003	2004
Revenue	$ 1,710,88	$ 3,598,516
Cost of Sales	4, 671,108	1,470,990
Gross Margin	$ 1,039,776	$ 2,127,526
SG&A	$ 345,092	$ 780,000
Operating (Loss)/Income	$ 694,684	$ 1,347,526
Interest Expense	113,446	105,450
Depreciation Expense	50,000	55,000
(Loss)/Earnings Before Income Taxes		
Income Taxes ($0 due to tax loss carried forward)	$ 531,238	$ 1,187,076
Net (Loss)/Earnings	**$ 531,238**	**$ 1,187,076**

Exhibit 2 (Continued)

Assets	2004
Current Assets	
Cash	$ 66,352
Accounts Receivables	591,537
Inventory	735,495
Total Current Assets	$ 1,393,383
Fixed Assets	
Plant and Equipment	$ 2,500,000
Depreciation	(570,000)
Net Fixed Assets	$ 1,930,000
Total Assets	**$ 3,323,383**

Liabilities and Stockholders Equity	2004
Current Liabilities	
Accounts Payable	$ 362,710
Income Taxes Payable	-
Total Current Liabilities	$ 362,710
Notes Payable	703,000
Total Liabilities	**$ 1,065,710**
Common Stock ($1 par value) Masters	$ 280,000
Common Stock ($1 par value) Investors	720,000
Additional Paid in Capital	-
Retained Earnings	1,257,674
Total Equity	**$ 2,257,674**
Total Liabilities and Stockholders Equity	**$ 3,323,383**

Exhibit 2 BioBlood's Unaudited Financial Statements, 2003 and 2004

Notes: No taxes were paid in either year due to tax loss carry forwards.

10 Simple Steps

1. Establish Base Point (from current P&L) for Sales, Gross Margins, Net Margins—so as to get Operating Income and Net Income before tax.
2. Determine market growth rate; establish projections for 5 years on Sales.
3. Project operating income on reasonable margins and net income.
4. Look at both Receivables and Materials/Payables to see if cash is being consumed to the extent that net income needs to be adjusted. (Once you buy the business, you can generate more cash by improving the collection of receivables or the reduction of inventories.) The balance sheet might also have to be cleaned up in terms of retiring undesirable debt.
5. Look to Business Plan and determine reasonable capital investments into the business for plant and equipment, and other types of expansion.

Exhibit 3 (Continued)

6. Determine tax rate.
7. Determine Discount Rate—The companies estimated weighted cost of capital, adjusted for extraordinary risk on particular deals, is a commonly used discount rate.
8. Layout Cashflow over five years, then discount back into today's dollars.
9. Establish terminal value. There are many different methods for doing this. A simple, useful way is to take net income for year five, and divide it by your discount rate, adjusted for the terminal growth rate. Then, discount that back to today's dollars.
10. Add 8 and 9 to get your valuation.

Details of Steps

The first step is to build a summary five year projected P&L for the target business. Start by analyzing the historic financial trends in the business, and then project out into the future. The key assumptions are sales growth rate, gross and then operating margin, and net operating assets. Growth in sales and operating profit is obviously a source of cash. Changes in net operating assets, such as investment in manufacturing capacity, are either a source or use of cash. Assumptions about these primary sources and uses of cash can only be developed by thoroughly analyzing the existing dynamics of the business and the future opportunities that can be exploited according to a plan for growth.

- sales growth,
- profitability,
- capital requirements, for things such as manufacturing capacity,
- the discount rate for the cost of capital
- and terminal growth rate, which is the growth rate applied to sales after the initial five year valuation period for asset valuation

Once profits derived from operations are calculated, one must consider other elements affecting cash flow:

- **Cash tied up in Accounts Receivables:** An average accounts receivables collection period of 60 days is typical in the pharmaceutical supply industry. Therefore, 60 days sales outstanding (DSO) is useful for the calculation (divide the projected yearly sales by 365 and multiply that by 60. Do this year for year, and look at the difference for an increase or decrease in A/R as a use of cash).
- **Cash tied up in Inventory (materials used in production):** It is not atypical to find that about half of the Cost of Goods Sold (COGS) is comprised of materials. Accordingly, students can apply the gross margin (to sales) to determine the cost of goods sold, divide that by half, and compare to find increases in materials inventory as the business is projected to grow. Such increases are also a use of cash.
- **Cash used for new plant and equipment:** As for net operating assets, Masters considered how best to grow the business in terms of adding new plant and equipment. He believed that an investment of about $1 million in additional manufacturing capacity (to make Endolab's MLA gel clot reagent) would be needed over the course of five years.

With five years of cash flow, we need to start the processes of determining a terminal value. With the discount rate in hand, the terminal value is generated for the deal by simply dividing the net income after tax of the fifth year by the discount rate. This provides a simple but precise short-cut to the nominal, or undiscounted, terminal value of the business. Terminal value represents the value of the continuing cash flow, in perpetuity. If only the discount rate is used as the denominator, the assumption is that growth in cash flow will be equal to the assumed rate of inflation. If one believes that the business will continue to grow at a rate greater than inflation, then a terminal growth rate needs to be added to the cash flows. This is done by simply subtracting the terminal growth rate (let's say 2 percent) from the discount rate (10.9 percent

Exhibit 3 (Continued)

minus 2 percent, resulting in 8.9 percent). The fifth year net income after taxes is divided by that number (8.9 percent) to produce the nominal value of future cash flows. A significant terminal value growth rate (say 5 percent) will obviously have a major impact on the terminal value, and thus, on the valuation itself.

Terminal Value = (Year 5 Net Income) / (Project Discount Rate – Terminal Growth Rate)

Now that you have a nominal terminal value, it too needs to be discounted back to present value dollars using the discount rate. The same discount rate should also be used to obtain the present value of cash flows from Years 1 through 5. The result is the total operating value of the business, expressed in current dollars and reflecting the buyer's investment cost.

Exhibit 3 A Valuation Template Based on Net Present Value of Projected Cashflow

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- **Cash used for new plant and equipment:** As for net operating assets, Masters considered how best to grow the business in terms of adding new plant and equipment. He told O'Brien that an investment of about $250,000 a year into plant and equipment (to make BioBlood's LAS gel clot reagent) would be needed over the course of five years.

Exhibit 4 O'Brien's Assumptions

Unfortunately, there is no one single method for valuing high technology companies. Instead, we need to use a combination of approaches and methods. These approaches and methods enable us to establish a range of value for what we call the subject company. The three most prevalent approaches are the market approach, the income approach, and the asset approach.[4]

The Market Approach

The market approach is based on the assumption that the best way to determine the value of a subject company is to study closely the values of other companies that have been involved in transactions that provide an indication of value. These transactions normally involve sales

[4] Our discussion assumes that we are valuing the subject company for the purpose of a sale, but, as noted above, the processes that an analyst would follow are essentially the same with the other valuation purposes. Note, however, that the analyst would need to account for additional factors such as a minority discount or a controlling interest when doing valuations for some of these other purposes.

Exhibit 5 (Continued)

of an equity interest in the public markets (i.e. an IPO) or to another company. Other types of transactions may also be useful; for example, the sale of a division or a product line may provide useful data.

The key concern with the market approach is that the comparison companies should be as similar as possible with the subject company. Obviously, it is impossible to have identical companies or exact historic transactions. The analyst, thus, needs to proceed through an iterative process of developing and applying common metrics and then adjusting the results to reflect differences between the comparison transactions and the subject company.

One of the primary challenges facing the analyst who uses the market approach is finding suitable comparable transactions and related data. Some sources to consider are general business publications including *The Wall Street Journal, The New York Times, Fortune, Forbes,* and *Business Week*. The technology industry also has several publications; investment bankers and industry trade associations are also good sources.[5] Finally, documents filed with the SEC and other federal agencies provide a wealth of useful data.

The analyst also needs to consider the "currency" used in the comparable transactions. There is obviously a difference between a transaction where the buyer pays cash versus stock that has significantly appreciated over the past few months in combination with a requirement that the seller hold the stock for a period of time. As compared with cash that the seller can use immediately, the stock is subject to market fluctuations. Similarly, transactions prior to 2001 that involved a pooling of interests often provided significant tax advantages that could have impacted the sales price.[6]

The Market Approach

Several metrics may be used when applying the market approach with technology companies. Three of the most common are:

Earnings Multiples—As with publicly-traded companies, one method of valuing companies is to apply a multiple to either present earnings or projected earnings, what is commonly known as the P/E ratio. This metric is generally more applicable for companies that have already established a market position and are profitable. Newer companies cannot typically be valued using this metric since management is more likely focused on growing revenue than in showing profits.

The analyst needs to be careful not to apply indiscriminately earnings multiples from publicly-traded companies when valuing most technology companies. The publicly-traded companies are usually larger, better capitalized, and have proven business models and, accordingly, better growth prospects. As an alternative in selected situations, the P/E ratios of publicly-traded companies may be possibly be used if adjusted by at least a factor of between 25 percent to as high as 75 percent depending on the similarities between the comparison companies and the subject company.

Normalization of the Income Statement

Typically, use of the earnings multiple metric with closely-held technology companies requires normalization of the income statement. Normalization refers to reviewing the income statements and tax returns and adjusting for discretionary spending and other factors that effectively reduce net operating income.[7] It is particularly important that the metrics used are

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[5] Several state and regional technology associations work with local accounting firms and consulting firms to gather and summarize financial data from their members.

[6] The FASB eliminated the "pooling" method of acquisition accounting as of June 30, 2001. The changes and new purchase accounting requirements are codified in Statement No. 141, Business Combinations, which replaced APB No. 16.

[7] Recognizing that accounting income and taxable income are different, whenever possible the analyst should review both the financial statements and tax returns.

Exhibit 5 (Continued)

consistent. For example, as discussed below, one metric often used is the ratio of sales price to earnings. While seemingly a simple ratio, in fact, the analyst needs to make sure that "earnings" are defined the same among the set of companies. Is it earnings from operations? Was/were there one-time events, even in normal operations, that impacted earnings? Or, is it earnings after-tax? The ratio could also be based on earnings before-tax.

Revenue Multiples—One of the more popular metrics used to value technology companies is multiples of revenue. Typically, this metric is useful when the subject company is experiencing rapid growth and has the strong likelihood of continuing to grow at or near the same rate in the intermediate future. It is also among the most easiest to apply to comparison transactions involving closely-held companies, since revenue is shown on income statements in a more consistent manner than earnings.[8]

Another advantage of revenue multiples is that analysts can make general assumptions about total market size and market share for the subject company and then apply a revenue multiple to obtain one data point for the valuation.

One factor to keep in mind when doing a valuation of a closely-held technology company based on forecasts is that the prospective buyer and the seller are likely to disagree on what numbers to use in the forecast. The buyer will want forecasted numbers based on the past, while the seller will obviously prefer to use numbers in the forecast that reflect future opportunities. Indeed, one of the statements one often hears in negotiations is that the buyer wants to pay based on last year's numbers and the seller wants to be paid based on next year's numbers!

Cash Flow Multiples—The traditional metric used to value most closely-held companies is cash flow, or, more specifically, free cash flow that the purchaser can use to finance debt or draw from the subject company. Since this metric is typically determined in the context of the amount of debt that can be supported, the analyst should be aware of interest rates at the time of the transactions used to develop the multiple. A company generally should have a higher value under this metric when interest rates are trending down, since the cash flow will be able to support more debt financing.

Adjustments

Unfortunately, applying any valuation tool using a multiple or some variation requires the development and "cleaning" of information about the "comparables". Each transaction is, by definition, unique, and the analyst needs to make adjustments in order to use the data to develop and apply one or more of the multiples. Obviously, the factors to consider when making adjustments to the data will vary with each subject company, but some of the most important to consider are:

1. Company size—Does the transaction involve companies of similar size and scope? Obviously, a transaction involving a company with $200 million in revenues is not likely to be a good comparable with a subject company that has revenues of less than ten million.

On a related note, using data from companies that have gone public as comparables with companies that are closely-held and much smaller is often not effective; companies that have gone public, with the exception of the dot-com boom, have proven business models, management, and scalability as compared with closely-held firms.

2. The other company in the transaction *(i.e.* typically the buyer)—How does the other party in the transaction compare with the list of prospective buyers of the subject property or one specific purchaser? A purchase by a company that has historically paid for acquisitions with stock and often has paid a premium based on the market

[8] This does not, however, eliminate the need to confirm the reality of the revenue numbers.

Exhibit 5 (Continued)

potential of the company being acquired is clearly different than a purchase by a company that is buying for more traditional, finance-based reasons. This different in approaches is defined by some observers as "strategic" or "investment" versus "financial-proven" purchases.

3. Market potential—What is the market size for the subject company's products and services as compared with those in the comparison group?

Products and services focused on a specific vertical market are likely to have less potential market size than those focused on the general public or companies. (Again, one of the reasons why using data from companies that have going public is often not a good idea.) Market potential is, however, an important factor when the acquiring company can easily assimilate the assets of the business being bought and scale the new business quickly.

4. Company business model—A major consideration when reviewing transactions is to assess the business models of the other companies. Even if the comparison companies are in the same markets, their business models may be quite different.

5. Company market position—What is the market position (pricing, reputation, etc.) between the comparison companies and the subject company? As with the business model, the analyst needs to make adjustments if the subject company is competing on a different basis than those used in comparison group.

6. Company tangible assets—Although often not a significant factor, the analyst may need to account for tangible assets when making comparisons with the subject company. Some of the comparable transactions may have included, for example, prime real estate, research facilities, or distribution facilities. An analyst needs to recognize that other tangibles, including cash, inventory, and accounts receivable are often not part of asset acquisition transactions, a primary form of purchases of smaller technology companies. Instead, purchasers seek to acquire technology and other intellectual property, *i.e.* copyrights, patents, and trade secrets, and often permit the sellers to keep the cash and working capital assets.

7. Company intangible assets—Obviously one of the most important considerations when making comparisons is the intangible assets. Indeed, the very basis of most transactions involving technology companies is intellectual property.

8. Company management—Often one of the major differences between companies is the quality and reputation of management. Did the comparison company transactions involve on-going management contracts? Or, was the transaction based solely on the company's tangible and intangible assets? How does this compare with the subject company transaction?

9. Financial structure—All comparisons need to be adjusted for the respective company financial structures and tax factors. For example, the analyst needs to determine if the price included assumption of debt or hybrid securities. One particularly difficult aspect of the financial structure is payments made for non-compete agreements with the selling company's key personnel. These agreements are rarely publicly disclosed. Also, the type of transaction. As noted above, a transaction a purchase with cash often needs to be valued differently than one involving stock, since the seller may be subject to holding periods with the stock and the tax treatment may be different depending on how the transaction is structured.

The analyst also needs to consider other factors that had a material impact on the price. Some examples of these material factors are litigation risks, *(i.e.* was the company acquired in litigation or under the threat of litigation of a material magnitude), accounting policies, and foreign business implications.

Exhibit 5 (Continued)

Income Approach

The income approach is essentially the development and application of a discounted cash flow analysis for the subject company. The key tasks for the analyst are to develop projections of revenue, develop a discount rate, and use the discount rate with the revenue projections to estimate the value of the subject company.

Developing the revenue projections requires more than simply taking the prior period numbers and applying an estimated growth rate. Specifically, the analyst needs to confirm that the subject company's business model is sufficiently scalable for the projected growth. Will, for example, new capital investments in fixed assets be necessary as the company grows? Each item on the income statement and balance sheet needs to be examined thoroughly, as well as staffing levels, market size/share, and distribution channels. Fundamentally, the projections need to be defensible with industry data and trends. As with the market approach, the income statement should be normalized to remove discretionary spending that reflects management's desire to reduce tax liabilities or is specific to the existing management team and not needed going forward. For example, the owners of a technology company may choose to have extraordinarily high spending for office space and first-class travel for senior management; these expenses would be minimized by new owners and professional managers.

Recognizing the volatility of the technology industry, it is usually best to limit the projections to no more than five years. Even going beyond two years for many technology companies may be difficult. Similarly, if a terminal value is used to account for a perpetual stream of cash flows, the analyst typically should be conservative. Indeed, recognizing the inherent risks and volatility of the technology industry, the analyst needs to confirm that the future terminal value does not account for a major portion of the estimated value of the subject company.

It is also important to limit the impact of assumptions pertaining to growth and market share when doing the projections. These assumptions are obviously important in estimating the potential of a company, but not in developing a valuation based on existing information and data.

Estimating the Cost of Capital

Obviously, a key factor in estimating value using the income approach is the discount rate. This rate represents the subject company's cost of capital, but estimating the cost of capital, particularly when risk factors are considered, is a difficult task. Unlike with publicly traded companies, the cost of equity capital cannot be easily estimated, and, accordingly, the use of the traditional financial tools of weighted average cost of capital (WACC) and the capital asset pricing model (CAPM) to estimate the cost of capital is almost impossible without making several assumptions that essentially define the outcome.

One of the most popular ways to estimate the discount rate is to use what business appraisers call the "build-up method". The build-up method is relatively simple to apply. First, the analyst establishes the risk-free rate of return at the time of the valuation. Typically, the rate on 20-year or 10-year Treasury bills is used as for the risk-free rate of return.

The next step in using the build-up method is to add factors or "risk premiums" for company size, loss of key personnel, liquidity, industry, business, and other company-specific risks. Here it is important not to "pile on" with every possible risk factor and, instead, to focus on which risk factors are most important. For example, the size risk premium usually encompasses other risk factors like liquidity. Another advantage of the size risk premium is that the analyst can draw from several published studies that estimate the relationship between size effect and equity returns. While these studies focus on publicly-traded companies, they are very helpful in establishing the magnitude of the size effect on equity returns and the costs of capital for technology companies.

The risk premiums used in the discount rate should also reflect a company's business model and earnings streams. Companies with recurring revenue streams supported by executed contracts from customers are clearly less risky than companies with earnings streams based

Exhibit 5 (Continued)

on transaction revenue. Put slightly differently, companies with customers and prospects with inelastic demand are likely to have a much smaller business risk premium and, in fact, perhaps, even a *positive* risk premium (i.e. the discount rate should be lowered), as compared with companies with customers and prospects with elastic demand.

There is some difference of opinion among some analysts as to how best account for the risk in the subject company's income returns. The traditional approach, as discussed above with the build-up method is to increase the discount rate, thus, reducing the net present value of the future cash flows. More recently, some analysts have suggested that the risk should remain in the cash flows with the discount rate representing solely the effective cost of capital for the subject company. Under this approach, the analyst uses several different cash flows with the same set of discount rates for the projections.[9]

The analyst should also be aware that the costs of capital will usually significantly vary between the subject company and the prospective buyer, particularly if the buyer is a publicly-traded company. More specifically, publicly-traded companies typically have a much lower cost of capital than closely-held companies, and using the buyer's lower cost of capital rate may have a dramatic impact on the valuation of the subject company.

Asset Approach

The asset approach is based on the assumption that the subject company has tangible or intangible assets that have value to the purchaser. In effect, the purchaser is valuing the subject company from the perspective of a "make versus buy" decision for the subject company's technology, client base, technical staff, or some other assets.

The analyst can often apply the asset approach using methods similar to the market approach. For example, the value of a technology company may be based on a dollar figure multiplied by the number of users (or customers). Other possible metrics for technology companies include multiples based on one or more intangibles including, for example, the number and quality of distributors, the quality and number of technical staff, and the size and quality of prospects in the subject company's product pipeline, patents, copyrights, trade secrets, and even name or market reputation.

Analysts need to be particularly careful when applying an asset approach (as well as indirectly the other approaches) to valuing specific technology programs and intellectual property, including copyrights, trade secrets, and patents, that enable technology functionality. More specifically, some analysts may mistakenly equate functionality related to intellectual property with the investment and process of creating the respective technology programs when doing comparisons.

Finally, although not a frequent situation, the analyst may find that a particular company or technology product has a greater value in liquidation than as a going concern. This typically occurs when a company is not growing or even experiencing declining revenue and has tangible and intangible assets that may be of greater value to other companies. Similarly, there may be transactions, particularly acquisitions, where the buying company effectively liquidates the selling company in all but name. The liquidation might include, for example, stopping research and development investments on products licensed by the selling company, eliminating support for the products licensed by the selling company after a specific period of time, and using the intellectual property of the selling company in products and business practices.

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[9] For a discussion of this alternative approach see, Dixit, Avinash, K., and Robert S. Pindyck, *Investment Under Uncertainty.* (Princeton, N.J.: Princeton University Press, 1994) and Luenberger, David, G., *Investment Science.* (New York: Oxford University Press, 1998).

Exhibit 5 Valuation Approaches and Methods