Biotech–pharma alliances: Strategies, structures and financing

Tyzoon Tyebjee and Jill Hardin

Date received (in revised form): 10th March, 2004

Tyzoon Tyebjee
is Professor of Marketing at Santa Clara University. He received his PhD from the University of California, Berkeley. He has been actively pursuing research on management issues facing growth ventures in the high-tech sector.

Jill Hardin
is currently working on the Northern California Childhood Leukemia Study at the University of California, Berkeley, where she is a graduate student in epidemiology/biostatistics in the School of Public Health. She received her MBA from Santa Clara University.

Abstract

The drug discovery and development industry is under intense pressure to become more efficient and develop drugs better, faster, cheaper. Consequently, pharmaceutical and biotechnology companies are entering into alliances in an effort to utilise each other's talents, exploit each other's specialisations, and create more value. In this paper, the economics of the drug discovery and development cycle are examined to identify the economic and strategic logic of the alliances. The financial instruments commonly used to structure the alliances are discussed with example case studies.

Keywords: *alliances, co-development partnerships, drug development economics, financing structures, joint ventures, licensing*

Tyzoon Tyebjee
Santa Clara University,
Santa Clara, CA 95053, USA

Tel: +1 408 554 4716
Fax: +1 408 554 5056
E-mail: ttyebjee@scu.edu

INTRODUCTION

Maturing product portfolios and competitive pressures due to patent expirations have been some of the factors that have stimulated the drive for innovation in the pharmaceutical industry. As a result, a vast amount of resources have been dedicated to the development of technologies that will increase the throughput of the discovery of new drugs. In the 1990s, many millions of dollars were spent on genomics technologies that would increase the number of drug targets and the subsequent discovery of many new drugs. As a result, the field of 'genomics' or the study of the genetic material, or genes of an organism, has experienced a revolution, culminating with the sequencing of the human genome in February 2001. As a part of this revolution, as is common with paradigm shifts and the birth of disruptive technologies, many new start-up ventures were spawned to pursue the opportunities that the new field offered.

The private equity market, sobered by the dot.com bust and a lacklustre initial public offering (IPO) market, has been an insufficient source of funding for these new ventures which require the continued infusion of capital to survive the many years that it takes to take a new therapeutic drug from discovery through development to commercialisation. At the same time, the large pharmaceutical companies, faced with maturing product portfolios and a lack of new drugs in their development pipelines, are eager to participate in the discovery and development of new drugs underway at the emerging biotechnology ventures. The strategic and economic logic that drives the formation of alliances between biotech and pharma companies is explored in this paper, along with the financing structures commonly found in these alliances. The reader is referred elsewhere for a discussion of partner selection[1] and alliance management.[2]

THE ECONOMICS OF THE DRUG DISCOVERY PROCESS

To understand the pressures on young biotechnology start-ups to partner with large pharma companies, we must begin with the economics of the drug discovery and development process. The current biopharmaceutical industry is based on drugs that interact with only 500 distinct targets. The genomics revolution has provided a plethora of previously undiscovered drug targets which ideally

will result in the discovery of many new drugs. Genomics technologies have evolved and have identified specific genes involved in a disease or bodily function. Once the genes are identified, ie discovered, in the research phase, the drug targets must be validated as useful. The next step in the discovery and development process involves the screening of thousands of candidate drug compounds against these targets to determine which compounds interact best with the target. Once automated assays have identified 'lead' compounds, they must then be tested on animals for toxicological effects during preclinical development. Compounds that do not elicit toxicological effects then officially enter the clinical development process where they are tested on humans and, barring any negative effects, they then undergo US Food and Drug Administration (FDA) approval.

In the year 2000, the drug development process required average expenditures of US$800m per commercialised drug. Costs are expected to double by 2005

In the year 2000, the drug development process on average required expenditures of US$800m per commercialised drug and this is expected to double by 2005.[3] The cost associated with the development of a drug can be further divided into the expense associated with each of the stages in the drug development and clinical trial processes, shown in Table 1.

The chance that a drug entering the discovery stage of the process will achieve FDA approval is less than 10 per cent; only one in 15 is approved

It should be noted that the risks and costs of new drugs is understated in Table 1 in several ways. First, only the development costs and technical risks of product development are portrayed. In addition to these, there are substantial marketing costs in launching a new drug as well as the market risk associated with weak product acceptance and threat of obsolescence, all factors that can depress market share and shorten life cycles and thereby depress profitability and commercial success. Also, Table 1 tracks costs over the development cycle on a project basis. The cost estimates shown in Table 1 include sunk costs of aborted projects which are reallocated to successful projects.

THE LOGIC OF PHARMA–BIOTECH ALLIANCES

Out of the US$800m necessary to develop a drug, US$568m or 71 per cent of the cost occurs during the clinical development and FDA approval stages. This is one reason that most alliances between pharma and biotech occur at Phase 1 trials or later in the drug development process. Besides the financial resources to support the clinical trial process, established pharma companies also bring competencies that are critical assets at the later stage of the development process. Compared with the biotech companies, pharma companies have vast experience in dealing with the FDA and shepherding drugs through the FDA approval process.

The chance that a drug entering the discovery stage of the process will fail to go through FDA approval is over 90 per cent; only one in 15 makes it through. The chance that a drug that passes Phase I

Table 1: The economics of the drug discovery and development process

	Basic research	Discovery	Preclinical development	Clinical development			FDA approval launch preparation
				Phase I	Phase II	Phase III	
Duration (yrs)	2.5	3	1	1.5	2	2.5	1.5
Cost (% of total)	4	15	10	15	22	31	3
Marginal probability of success (%)	30	75	50	70	50	70	90
Successful compounds exiting at each stage[a]	30	23	11	8	4	3	2

[a] Assuming 100 compounds enter into basic research
Source: Lehman Brothers & McKinsey and Company, 'The Fruits of Genomics', 30th January, 2001, pp. 24 and 83

fails to meet FDA approval is 75 per cent; only one in 4 makes it through. Phase II establishes the Proof of Clinical Concept which demonstrates the efficacy of the drug. At this point, the risk profile of the drug under development changes substantially. On the average, one of every two drugs exiting Phase II receives FDA approval. From a risk-management perspective, pharma companies find it attractive to engage with ventures that have met Phase II requirements.

From a risk-management perspective, pharma companies find it attractive to engage with ventures that have met Phase II requirements

Biotechnology companies are adept at innovative research and are generally more flexible and able to adapt more rapidly to changes in external conditions than pharma. Changes in external forces may be in the form of amendments to regulatory rules of the FDA or new laws governing financial accounting practices. Biotech companies excel at innovative research mainly because of their smaller size, flexibility and ties to innovative thinkers at research institutions and universities. They generally employ personnel who do not carry preconceived notions about drug discovery and are willing to experiment and think 'out of the box'. Biotech companies also tend to foster a more entrepreneurial work environment, which promotes innovation. On the other hand, they are typically cash poor relative to pharma companies, often operating in the red, and therefore are interested in preserving their cash reserves. Consequently, they tend to be motivated by partnerships that increase their access to capital as well as give them access to resources that support clinical trials and commercialisation.

Typically, a biotech company contributes a promising product or technology and the pharma company contributes the capital required to take this product through approval and to market

In most biotech–pharma alliances, the biotech firm is the technology seller and the phama firm is the technology buyer. Pharma's objectives in the alliance are to expand their product portfolios by controlling the development and commercialisation of new drug platforms being spawned outside their own organisation, but doing so with the minimum exposure to their profit and loss (P&L) statement. Biotech's objectives are to obtain and retain capital, validate their technology and translate it into commercial profits, but doing so with minimal dilution of their stock. More specific partnering motivations lie in the exchange of skills and assets required to develop drugs. The biotech company offers the pharma access to technology platforms, chemical libraries of drug candidate compounds, biologicals and previously intractable biological targets. The pharma company offers the biotech company access to its expertise in conducting clinical trials, and to its sales/marketing channels.

In most biotech–pharma alliances, the biotech firm is the technology seller and the pharma company is the technology buyer. Pharma companies prefer to engage after the new drug has met Phase III requirements

In summary, the strategic logic of alliances between biotech and pharma companies is derived from several sources. First, they contribute different competencies which are required for successful new drug development. The biotech's competencies lie in entrepreneurial innovation and flexibility, whereas the pharma's competencies lie in managing the intricacies of the FDA's new drug approval process and the marketing skills needed for product commercialisation. Secondly, the two parties contribute different assets to the relationship. The biotech company contributes a promising technology and the pharma company contributes the capital required to take this product through approval and to market. Finally, from a risk management perspective, the alliance allows the risks of new drug development to be allocated to the financial markets most suitable to bear them. The high risks of early stage product development are borne by the venture capital (also called risk capital) investors and the lower risks of later stage product development are borne by publicly traded pharma companies whose shareholders are relatively risk averse.

STRUCTURING THE ALLIANCE

There are several instruments by which pharma companies can infuse financial and non-financial resources into the biotech partner. Specific deals can be quite complex in that they combine

several of these mechanisms. Three financial instruments commonly used are cash payments, equity investments and loans. A non-financial mechanism is the pharma company providing the biotech company access to its vast R&D, sales and marketing resources, facilities and organisation.

- **Cash**: pharma may choose to infuse cash into the biotech either as R&D milestone payments or as licence fees. The downside of this mechanism is that it adversely impacts the P&L of the pharma partners.

- **Equity**: pharma infuses capital into the biotech in exchange for equity shares. Depending on a wide variety of factors too complex to elaborate here, this mechanism may have no immediate impact on the pharma partner's P&L.[4] However, it does introduce a new difficulty, namely how to estimate the valuation of companies which have largely intangible assets, little or no revenues and long time-to-market horizons. There are also uncertainties about how and when the equity investment can be liquidated through an IPO or sale to a third party. A positive for equity mechanisms is that the capital markets seem to view them favourably. The market value of biotechs who had one or more pharma equity partners averages 25 per cent higher than that of biotechs who had no equity partner.

Financing options are becoming more creative as capital markets are shrinking and regulatory rules are in flux

- **Loans**: loans may be repaid in cash, the technology provider's stock, or from commercial profits or royalties generated by products of the alliance. The most common structure, assuming the alliance is successful, is that the loan is repaid using commercial profits and if the alliance is unsuccessful the loan is repaid using the biotech's equity at the market value of the stock at the time of repayment. Another interesting type of loan includes purchase of a special class of equity from the seller, which converts to an unsecured promissory note in the event that the alliance is terminated early; otherwise it converts to common biotech shares at a predetermined price. In another type of biotech loan deal, a series of licence option payments are made that are refundable (plus interest at prime rate) until the biotech exercises the licence option whereupon they become part of the licence fee. At times the pharma partner may also assist the biotech partner in raising funds by underwriting loans from third parties.

- **Research assets**: an alternative financing methodology available to biotechs involves the use of pharma's assets. This may be in the form of the utilisation of pharma's compound libraries for screening against drug targets or receiving the services of pharma's sales and marketing forces to access established sales channels. Other assets utilised in pharma and biotech alliances involve the use of pharma's manufacturing facilities rather than placing the burden on the biotech partner to build manufacturing facilities. This type of asset transfer provides substantial opportunities for pharma to contribute value to their biotech partner while not impacting on pharma's P&L statements or operating budget.

Financing options are becoming more creative as capital markets are shrinking and regulatory rules set forth by institutions such as Financial Accounting Standards Board (FASB) and the Securities and Exchange Commission (SEC) are in flux. Some of the more recent creative financing vehicles described below are special purpose entities (SPEs), private investment in public equities (PIPES), royalty financing, bridge financing and co-development deals.

Special purpose entities

Special purpose entities (SPEs) are financing vehicles used to sell an asset

SPEs are financing vehicles used to sell an asset. An example would be the sale of a licence to a drug candidate compound by a biotech company. The biotech company sells a technology asset to an SPE in order to spin off research and development and to allow losses from development efforts to be captured in the separate entity. One or more pharma partners also take equity positions in the SPE, usually with cash investments. The losses are not incorporated into the income of the parent company and instead show as a balance sheet asset at the level of the cash invested. Consequently, the parents do not see an earnings dilution on their P&L statements.

Under the previous FASB rules, this was an acceptable method of accounting for the loss as long as the parent company's ownership share did not exceed allowable limits and the parent company did not exercise control of the entity. Buy-out options and warrants allowed the parent company to repurchase the SPE once the development effort was a sure success. SPEs allowed participating companies to hide losses and show gains (if the partnerships were successful) on their financial statements. In 2001 the FASB changed the rules regarding the definition of 'control', which has resulted in companies participating in SPEs to be forced to disclose their losses and holdings explicitly on their financial statements, virtually eliminating the benefits of SPEs. Furthermore, in January 2003, the SEC added amendments to the Sarbanes-Oxley Act of 2002 that require companies to provide explanations of their off-balance-sheet arrangements (SPEs) in a separate section of the 'Management's Discussion and Analysis' section of their annual and quarterly financial reports. This new amendment has necessitated more comprehensive disclosure to investors and has thus made it more difficult to hide or misrepresent off-balance-sheet arrangements.[5]

The SEC added amendments to the Sarbanes-Oxley Act of 2002 that require companies to provide explanations of off-balance-sheet arrangements such as SPEs

Private investments in public equities

Private investments in public equities (PIPEs) involve an individual investor or group of investors negotiating directly with a company to purchase shares, often at a discount to the market price

PIPES are a method of financing for biotechnology that has been used recently owing to poor stock market conditions. Falling biotechnology stock prices results in a reduced ability to raise money by selling shares of stock to the public. The PIPE financing method involves an individual investor or group of investors negotiating directly with a company to purchase shares, often at a discount to the market price. This allows the biotech company to receive money but at a reduced price.

PIPES come in many varieties. In the simplest form, the investors purchase common stock. However, often, the speculative investor instead buys the debt or preferred stock that can be converted into common stock. This introduces a new element of risk for the biotech. If its share price continues to fall, the conversion of the debt or preferred stock would result in the investors receiving more of the biotech's equity. Some biotech companies may be desperate and agree to PIPE financing terms that are 'toxic', which result in severe dilution of the value of the existing shares of stock, damaging existing stockholders but nonetheless securing financing to continue operations. Compared with the delays associated with SEC rules for public offerings, PIPES are quick to set up and allow biotechs in desperate financial situations to receive money quickly to continue operations. Investors who are looking for strategies whereby to short stocks often seek companies that participate in PIPE financing deals. For a pharma partner, this type of investment only makes sense if it desires to acquire the biotech firm but believes that the market will continue to undervalue the biotech's stock price.

Royalty financing

Royalty financing has gained popularity recently (since 2000) and has been used by a few financially creative companies. It too is largely a result of the shrinkage in

the capital markets. Companies that require cash for development of a specific drug candidate and that have reduced stock prices, and therefore cannot consider selling stock on the public markets, have used royalty financing to raise cash to fund development projects. Royalty financing allows the borrower to receive staged payments that can then be matched against income expenses, generally research and development expenses, to the best advantage of its financial statements. It also allows the borrower's financial ratios (debt/equity) to be unaffected, allowing them to maintain a position of power in the public markets. Royalty financing is generally for drug development projects in Phase III or later, which have a high probability of success, and where the future cash flows generated from the resulting product can be accurately forecast.

Royalty financing is generally for drug development projects in Phase III or that have a high probability of success

The amount of the royalty financing is dependent on the future cash flow of the product in development. The lender in royalty financing, typically a pharma company in the case of biotech borrowers, carries the debt and it is collateralised by future cash flows. It is in effect a guarantee of repayment of the loan. The lender negotiates a certain percentage of the future revenues and the annual royalties of the product, up to an agreed ceiling price, with a clause that states once the agreed ceiling is reached, the percentage participation will fall to some lower percentage for the remainder of the loan period. This financing option is very attractive to both the lender and the borrower.

Bridge financing

The bridge collaboration often begins as a joint venture of a late-stage product and morphs into a bridge partnership, which then leads to an acquisition. Bridges usually occur as a result of biotechs spending most of their resources on development of their first product, which results in little cash for support of the rest of the products in development. A typical scenario unveils after the company launches its first product and the near-term revenue does not meet expectations, which drives the stock price down. The company requires more products to maintain earnings growth, but cannot afford to drive market penetration of its principal product and it cannot put money into its pipeline, leaving the best choice as entrance into being acquired by one of its collaborators.

Bridge financings usually occur as a result of biotechs spending most of their resources on development of their first product, which results in little cash for support of the rest of the products in development

Bridges offer advantages to biotechs as the structure creates both a ceiling (the call price) and a floor (the put price) on an eventual acquisition. The put price is a small premium to the market price, and the call price is a multiple of the current market value. This arrangement keeps the seller away from competitors and motivates them to succeed in the joint venture. The seller no longer has to worry about its short-term burn rate or how the market perceives its quarterly earnings as they have a floor and ceiling on their stock price. Bridging allows each partner to maximise the value of the relationship as the buyer can leverage its balance sheet by providing capital to fund development without dilution while the seller can recognise the expenses without fear of the market's reaction and subsequent impact on their stock price. Each partner can leverage their existing capabilities and avoid making redundant investments in manufacturing, sales or marketing.

Co-development

Co-development is not strictly a financing mechanism but rather a clause that is included in many alliances. The definition of co-development varies widely depending on the context and stage of the deal. Generally co-development is associated with later stage drug development deals. Historically, co-development deals often meant that biotech companies paid for their own research and development or that they had the opportunity to participate in late-stage development but not in commercialisation of the drug and subsequent royalties from the sale of the drugs. Today, co-development deals

Generally, co-development is associated with later stage drug development deals

allow the biotech partner to participate in a product's advanced clinical development and commercialisation.

This change is due to an increase in investment in the biotechnology sector during the past few years. This, combined with scientific advances in several technology arenas, have allowed biotech and pharma companies to develop more equal risk-taking and equal profit-sharing deals. Biotech companies that can develop a compound into Phase II development are able to negotiate deals where they are able to share equally in the downstream value of the drug. The new deals provide equal risk taking and equal profit sharing, creating greater incentives for successful partnerships.

The shift towards more equal partnering has occurred because biotech companies have been able to secure larger amounts of financing and therefore can financially afford to develop their lead candidate compounds further

This shift towards more equal partnering has occurred because biotech companies are able to secure larger amounts of financing and therefore can financially afford to develop their lead candidate compounds further. Biotechs have been able to secure greater capital because of shifts in the investment cycle.

CASE STUDIES

A licensing case study – Vertex Pharmaceuticals, Inc. and Wellcome

In 1993 Vertex, then a biotech company, possessed a lead drug candidate compound, VX-478, that it believed could be developed into a potent Aids inhibitor. Vertex lacked the capital to develop the compound into an approved drug and therefore entered into an alliance with Wellcome.

Wellcome signed an early stage deal with Vertex in December 1993 and paid Vertex US$42m to develop orally active protease inhibitors for the treatment of AIDS and HIV infection. The deal also involved another partner, Kissei Pharmaceutical Co., as Vertex had previously assigned Far East rights to its inhibitor to Kissei. When the partnership was initiated, Vertex's lead compound was in the preclinical stages of development. The alliance resulted in success for all three partners: GlaxoWellcome added another Aids drug (Agenerase) to its portfolio, while Vertex delivered its first drug onto the market, obtained co-promotion rights in the USA and key European countries, and negotiated a 15 per cent combined royalty on worldwide sales by Glaxo and Kissei (which launched the drug as Prozei in Japan in 1999). Searle & Co. also received a royalty as they had applied for patents in the area of HIV protease inhibition. In order to free themselves from future intellectual property claims, Vertex and Wellcome obtained a worldwide non-exclusive licence to those applications in July 1996 and paid Searle a royalty in exchange. Thus far Agenerase, which was approved in 1999, has generated US$233m in revenues and still has another approximately 12 years left to generate revenues without competition from a generic form of the drug.

A co-development case study – Centocor, Inc. and Eli Lilly

In 1992 Centocor had a lead drug, Centoxin, in Phase III trials to treat septic shock that it partnered with Lilly to develop. Lilly paid Centocor US$50m in upfront payments for distribution rights to the drug and US$50m in equity at a 100 per cent premium to the market price. Lilly also paid a US$25m licence fee for an option on Centocor's next product moving through clinical trials, ReoPro, targeted towards the cardiology market. Lilly funded the product's development in part via US$25m in milestone payments, with Centocor paying for the remainder of the development expenses. In 1993, Phase III trials of Centoxin were halted because of unexpected patient deaths and subsequently Centocor terminated development of the drug. This meant that Lilly's original deal was awash. Meanwhile Centocor's second drug compound, ReoPro was in Phase III trials for patients with unstable angina. Fortunately Lilly picked up its option on ReoPro and it was a success for both Centocor and Lilly. ReoPro was approved in 1995 and Lilly and Centocor

have since shared the royalties on ReoPro sales, which have totalled US$1.9bn. The late stage failure of Centoxin morphed into a late stage success of ReoPro and an alliance that created value for both pharma and biotech.

Collaborations between biotechs and pharmas have recently resulted in greater value for each party due to the fact that biotechs have been able to secure larger amounts of capital through creative financing options and the hot capital markets in the late 1990s and in early 2000. Larger funding has resulted in biotechs becoming more able to develop a lead compound into later stages of the FDA approval process and therefore adding more value to pharma.

Joint ventures allowed Elan to shift R&D costs off its books and to book revenue in advance of product development, misrepresenting its position to investors

A royalty financing case study: SkyePharma

SkyePharma plc, a UK biotech company focused on drug delivery, recently entered into a royalty financing deal, which allowed it to continue development of DepoMorphine, a time-release version of the well-known painkiller, morphine. The drug was in Phase III trials when the deal was initiated in 2001. SkyePharma received a total of US$30m between 2000 and 2002 from a secondary market venture capital group to fund the clinical development and regulatory submission of DepoMorphine. In return, the investor group received a portion of future royalty and revenue streams from DepoMorphine and three other SkyePharma drugs currently on the market. Between January 2003 and December 2014 the venture capitalists will receive 15 per cent of the annual royalties and revenues from the products, up to an agreed ceiling amount. Once the predetermined ceiling is reached, the percentage participation will fall to 3 per cent for the remainder of the period until December 2014.

SkyePharma entered into a royalty financing deal and received £30m from a secondary market venture capital group. In return, the investor group received a portion of future royalty and revenue streams from SkyePharma drugs

This type of deal benefits both SkyePharma and the venture capitalists. SkyePharma will continue development of a promising drug while the venture capitalists can be assured revenue on three of SkyePharma's currently selling drugs and can take a modicum of risk on the revenue stream from DepoMorphine. It is a winning deal for both parties.

Case study of a financing structure gone bad: Elan's SPEs

Elan Corporation, a pharmaceutical company, is known for its accounting prowess and unusually structured research and development joint ventures.[6] The joint ventures allowed Elan to shift R&D costs off its books and to book revenue in advance of product development. This type of deal structure escalated revenues and earnings and was difficult for investors to evaluate. These deal structures have come under intense scrutiny following the collapse of Enron and some aspects have become illegal in the post-Enron regulatory environment. Consequently, the Elan case study is included here largely for historical interest.

In a typical deal, Elan invested US$17m in the convertible preferred stock of a partner with which it was forming a joint venture. The joint venture, essentially an entity with few or no employees, was capitalised with US$15m from the partner (in effect a pass-through of Elan's investment in the partner) and US$3m of additional monies from Elan. Elan held a 19.9 per cent ownership stake in the joint venture and the partner a 80.1 per cent stake. The joint venture immediately paid Elan US$15m for a medical technology licence or an R&D contract (see Figure 1). Elan booked that US$15m as revenue. However the money that Elan had invested in the partner and joint venture had no impact on the P&L statement as it appeared on the balance sheet, where it is an asset. In effect, Elan converts US$15m of cash it already had into new revenue. The joint venture would operate at a loss but Elan could use the 'cost method' of accounting and would not have to report its share of the joint venture's losses as long as its equity position in the joint venture was below 20 per cent and it had had no significant control over the joint venture.

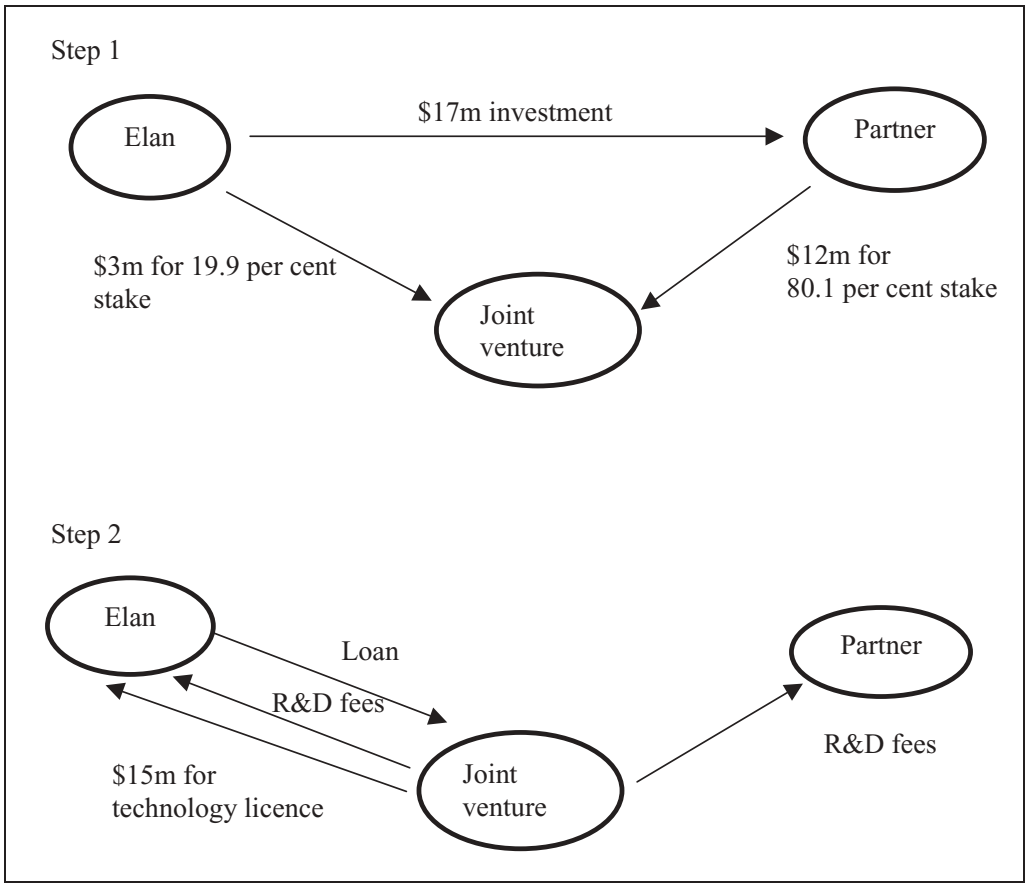

Figure 1: An example of Elan's joint venture structures
Source: *Wall Street Journal* (2002), 'Partnerships give Irish drug maker rosy financial glow', 30th January

Following the Enron scandal, Elan's accounting practices came under intense scrutiny. Some of the criticisms levelled were that:

- Elan was booking licensing revenue received from entities which had not even formulated, let alone embarked on, a drug research programme and from entities, and thereby creating phantom revenue;
- Elan was not using the 'equity method' of accounting to report its share of the joint venture's losses even in those ventures where Elan exerted significant control through board representation and veto power; and
- Elan was taking excessive write-offs as a one-time charge for the research programmes of its acquisitions, thereby avoiding having any decline in the acquisition's market value flowing through to Elan's operating P&L as loss of goodwill.

Elan is based in Ireland, but is listed on the New York Stock Exchange. It has changed its financial reporting practices to comply with SEC regulations and generally accepted accounting practices (GAAP). As part of this compliance, it took a write-off for past revenues that had been reported, but under the new rules required to be recognised over the life of Elan's agreements with its joint ventures. This adjustment, curiously, had the effect of allowing the recognition of the revenues that it had written off.

The share price performance of Elan seems to indicate that it has regained investor confidence. This reflects, in part, the fact that Elan has embarked on shedding its under-performing joint ventures. Additionally, 36 of 55 of Elan's joint venture deals resulted in products transitioning to clinical trials, which is roughly a 65 per cent success rate. By all counts, this is an excellent rate of success.

Although Elan's accounting practices may have been questionable, its ability to enter into participate in successful deals is noteworthy.

Transparency of financial transactions between alliance partners is critical if such alliances are going to be attractive to investors

The Elan case study is a good example of the importance of the transparency of financial transactions between alliance partners is critical if such alliances are going to be attractive to investors. The Elan transactions served the purpose of getting R&D expenditures off the books but in doing so investors were misled. Money that was loaned to the joint venture was paid back to Elan and booked as revenues, thereby effectively 'round-tripping' cash. The new rules that govern off-balance-sheet accounting are complex and will not be detailed here. They share some underlying principles, namely that aggressive financial structures without underlying economic and business substance will be looked at askance, there must be some real transfer of risk between parties, and the transparency of the transaction structure is a must.

TRENDS FOR THE FUTURE OF THE INDUSTRY

The drive to become a more efficient industry has created specialisations, resulting in biotechs that are innovative and pharma companies that are the capital providers and adept at negotiating the regulatory processes and marketing and selling drugs

The drug discovery and development industry is under intense pressure to become more efficient and develop drugs better, faster and cheaper. The automotive and the semiconductor industries have undergone these efficiency improvements over the past 20 years, which have resulted in the development of more complex and more powerful products produced in shorter product cycles, and products that are more affordable. The drug industry is at the onset of increasing its efficiency and in the midst of developing specialisations, automating the discovery and preclinical testing of candidate compounds, with the next step likely to be the extensive use of lower cost offshore talent.

The drug industry is at the onset of increasing its efficiency and in the midst of developing specialisations

The drug industry has been well financed over the past ten years; however recently a tougher financing environment has emerged with a downturn in the financial markets and changes in the regulatory environments. The public is demanding drugs be made more affordable for everyone. The population as a whole, but specifically the 'baby boomers', is ageing and demanding an increased quality of life. Therefore, more drugs are in development for various ailments and diseases that do not represent a billion dollar market. Given an average cost of developing a drug at US$800m, pharma prefers pursuing therapies that represent a billion dollar market or larger.

The drive to become a more efficient industry has created specialisations, resulting in biotechs that are innovative and pharma companies that are the capital providers and adept at negotiating the regulatory processes and marketing and selling drugs. Further specialisations have formed within the biotech industry, with genomics and proteomics acting as a piece of the discovery engines and biotech instrumentation companies providing tools. Recently bioinformatics companies have formed to specialise in the information technology arena of drug discovery and development, and provide predictive tools to scientists in order to try to focus efforts to perform the most successful experiments. Many outsourcing companies have evolved, which specialise in discovery and preclinical testing of compounds, in addition to companies that specialise in the performance of clinical trials and excel in dealing with the FDA. One can only presume that more specialisation will occur, hopefully with many other countries taking advantage of the specialisation opportunity, specifically countries that have decreased labour and infrastructure costs but highly educated workforces, such as China and India.

A more efficient industry will depend on biotech and pharma's abilities to continue to negotiate creative financial deals that benefit both parties. Pharmas and biotechs are evolving to better understand how they can mutually benefit each other and create the most value for themselves in the process, which will ultimately benefit the industry and those that utilise its services.

Acknowledgment
This paper is based on Jill Hardin's MBA thesis supervised by Professor Tyebjee.

References and notes

1. Rhodes, I., Nelson, C. and Berman, G. (2003), 'The key to successful collaborations: Rigorous and independent due diligence', *J. Comm. Biotechnol.*, Vol. 9, pp. 297–304.
2. Ireland, R. D., Hitt, M. A. and Vaidyanath, D. (2002), 'Alliance management as a source of competitive advantage', *J. Management*, Vol. 28, pp. 413–446.
3. Lehman Brothers & McKinsey and Company (2001), 'The Fruits of Genomics', 30th January, p. 46.
4. When the impact occurs on the P&L depends on a wide variety of factors such as the GAAP regulations with which the pharma company must comply, the extent of control the pharma exerts over the biotech, whether the biotech company is privately or publicly held, etc. Under GAAP rules in the USA, the portion of the value paid for in-process R&D, namely projects that are at a highly incipient stage, must be written off at the time of equity investment. Additionally, any change in goodwill must be evaluated periodically and the appropriate charge taken on the P&L. In some countries, it may be possible to carry the purchase price of the equity on the acquirer's balance sheet indefinitely and not take a charge to earnings even if a premium were paid.
5. For a more in-depth discussion see: US Securities and Exchange Commission, Press Release, 22nd January, 2003, 'SEC Adopts Rules on Disclosure of Off-Balance Sheet Arrangements and Aggregate Contractual Obligations' (URL: http://www.sec.gov/news/press/2003-10.htm).
6. Eisinger, J. (2002), 'Research partnerships give Irish drug maker rosy financial glow', *Wall Street J.*, 30th January.