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## Exploring The “Virtual” Company Strategy Through Outsourcing In The Biotech Industry

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Scientists are constantly furthering knowledge and understanding of genetics and exploring how to solve complex problems by changing the basic building blocks and structures of life. The purpose of this paper is to question whether the same sense of exploration and disruptive thinking should be applied to the basic business models that are used to build biotech companies and whether one particular organizational theory, the “virtual company,” presents a theory that is particularly well suited to the development of fast growth, biotech enterprises. As a result of developments in the sophistication, breadth and number of outsourced service providers and innovations in information technology, the opportunities for building a virtual organization have increased. This paper suggests that with appropriate strategic planning, careful contract negotiations and ongoing management, outsourcing can provide many efficiencies and advantages over building a fully or quasi-integrated corporation. While a fully virtual organization may remain impractical today, there are potential advantages from expanded use of outsourced services and much to be said for re-evaluating a virtual organizational structure for biotechs.

### Organizational Strategies

For purposes of this discussion one can think of strategies for business structures falling into four main categories<sup>i</sup>, which are briefly defined below. Each exists some place on a continuum with a fully integrated organization at one extreme and a “virtual” or non-integrated organization on the other extreme. Chart 1 below illustrates how all of these strategies seek to exert control over the various resources comprising the value chain in a business, but achieve that control with different levels of integration of resources.

**Full Vertical Integration:** Organization seeks to control the value chain through direct corporate ownership of business units at each stage of the value chain<sup>ii</sup>.

**Tapered Integration:** Organization has direct corporate ownership of many of the business units in the value chain, but outsources one or more stages of the value chain. The degree of vertical integration will be different from organization to organization.

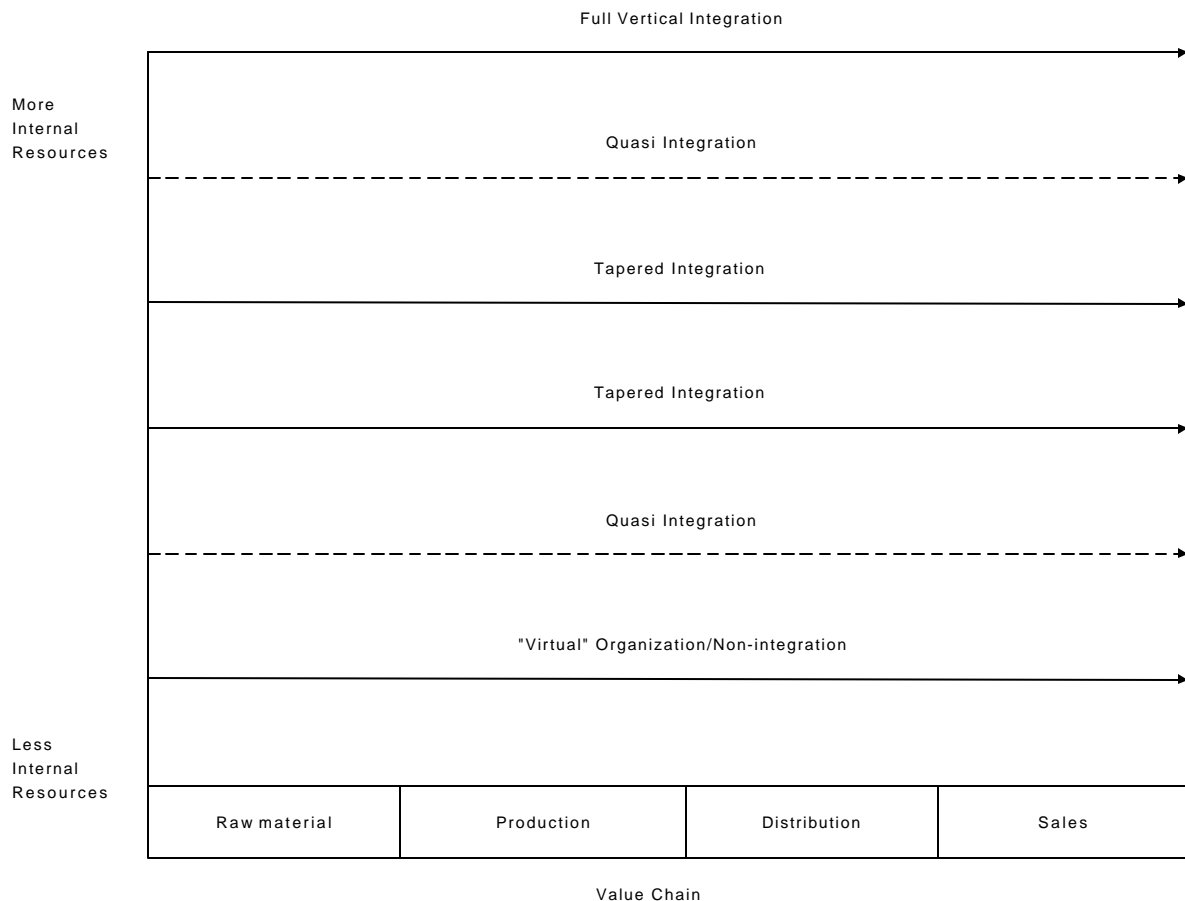
**Quasi-Integrated:** Organization seeks to control value chain activities through joint ventures with other firms and organizations<sup>iii</sup>. The degree of vertical integration will be different from organization to organization.

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**“Virtual”/Non-integrated:** A collaborative network of independent organizations and people sharing skills, costs and access to one another’s markets, linked by information technology. The virtual organization only retains its “core competencies” and maintains control over its value chain through contractual arrangements.

Chart 1 : Organizational Strategies



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The biotech industry to date has been largely built with a combination of tapered and quasi-integrated strategies. Even the industry’s largest and most successful players are not fully integrated organizations. For example, Genentech relies upon marketing and distribution arrangements with other biotech and pharmaceutical companies, and Amgen has similar marketing and distribution arrangements as well as contract manufacturers for some of its products. Almost every biotech company has one or more research relationships with academic institutions and/or contract research organizations (CROs). These strategies have been employed for decades in large part because of the enormous costs of building vertically integrated resources in relation to research, clinical trials, manufacture, distribution and sales of

drugs. The pharmaceutical industry has already made the capital investment into exactly these types of resources and has a constant need for new and innovative drugs. Thus, it has always made sense for biotech companies to partner with “big pharma” because it is a rational commercial collaboration for the players in both industries.

So what is the difference between the strategies employed today and the concept of a “virtual” organization? As Dickerson explains<sup>iv</sup>, it is basically a question of degree. The virtual organization further reduces the amount of vertical integration to a level where all that is left is a “hub” consisting of the core competencies of the organization which manages a series of collaborations and contracts with third parties. Taken to its extreme in the case of a biotech company, this may essentially mean that the biotech company’s integrated resources are limited to a key management team and the facilities needed to support their activities. The virtual organization strategy appears to be well suited to the biotech company because of the critical and otherwise conflicting needs of a biotech for flexible access to the best worldwide thinking and resources, conservation of capital and speed in business decisions, processes and market entrance. Biotech research and development involves a constant process of setting up and breaking down hypotheses, research programs and products. Subject matter experts are dispersed in laboratories, institutions and companies all over the world, connected by global communications, scientific publications and the Internet. The successful biotech company connects all of these dots, moves quickly from failed avenues of research to new avenues and keeps ahead of other market entrants because of its speed in bringing products to market.

The virtual organization is designed to maximize the organization’s ability to meet these needs of flexibility, access to the best resources and speed. Instead of investing heavily and in advance in infrastructure and employees, the virtual biotech company can readily shift from one research program to another and contract for services and knowledge from experts all over the world. Valuable research dollars can go to the researchers that best meet the biotech’s development, cost and timing parameters. The global market for services creates greater supply and thus better service delivery as a result of greater competition. Scarce capital can be retained and used as working capital. Finally, if all goes well the company’s research programs and operations can be rapidly scaled by contracting for vertical services (e.g., manufacturing, promotion, distribution and sales) from much larger organizations who have already invested in building that infrastructure. These business drivers are particularly important for a biotech company and hence why the discussion of virtual corporations in this context is so relevant.

My research has found relatively little written on the topic of virtual biotech companies. While there are many excellent papers and books on virtual organizations as a business structure (see attached bibliography), there is very little that examines these theories specifically in the context of biotech. Biotech companies are sometimes cited as an example of the kind of high tech, rapid growth organizations that would be well suited to a virtual organization strategy, and there are numerous articles on tactical outsourcing decisions in the pharmaceutical industry, but the discussion goes no further. One case study, which took place during September 1997 at a workshop held through a partnership program among the Universities of Twente, Kiel and Lüneburg and the Manchester Business School (the “1997 Case Study”), did examine the specific question of managing biotechnology using a virtual company model. Their particular “virtual biotech company” was initiated by regional government and appears to have been more focused on building a support mechanism for the growth of a biotech region or community, with some 150 independent companies linked via a core headquarters with staff performing various administrative tasks to maintain the network of collaborations. Similar biotech regions and industry groups have been created throughout the U.S. and Europe<sup>v</sup>, all being somewhat different and with varying degrees of formal structure, resources and government involvement.

These virtual “support” type organizations are not the focus of this paper, but they do demonstrate examples of collaborative networks of players in the biotech industry. In addition, the report of the 1997 Case Study<sup>vi</sup> provides us with the following observations on the virtual organization concept in the context of biotechnology:

- Highly complex R&D and international competition leads to more cooperation, particularly amongst small and medium sized organizations.
- Costs of managing a network of collaborations can be reduced if trust and commitment can be built between the participants.
- Commitment is hard to gain and make proportionate. Commitment is also easy to lose and thus commitment should be given the opportunity to grow in collaborations.
- Participants in any collaborative network have differing interests and differing levels of commitment and motivation. This problem can be addressed in part by open communications between the participants, particularly in terms of the core competencies and specialist talents/resources of each participant, and through an understanding of the difficulties of accomplishing the same goals outside the collaboration.
- There needs to be clear communication with organizations that are external to the collaboration, so that the rest of the world understands the benefits and capabilities of the collaboration.
- Information technology can be key in enabling the communication flow.

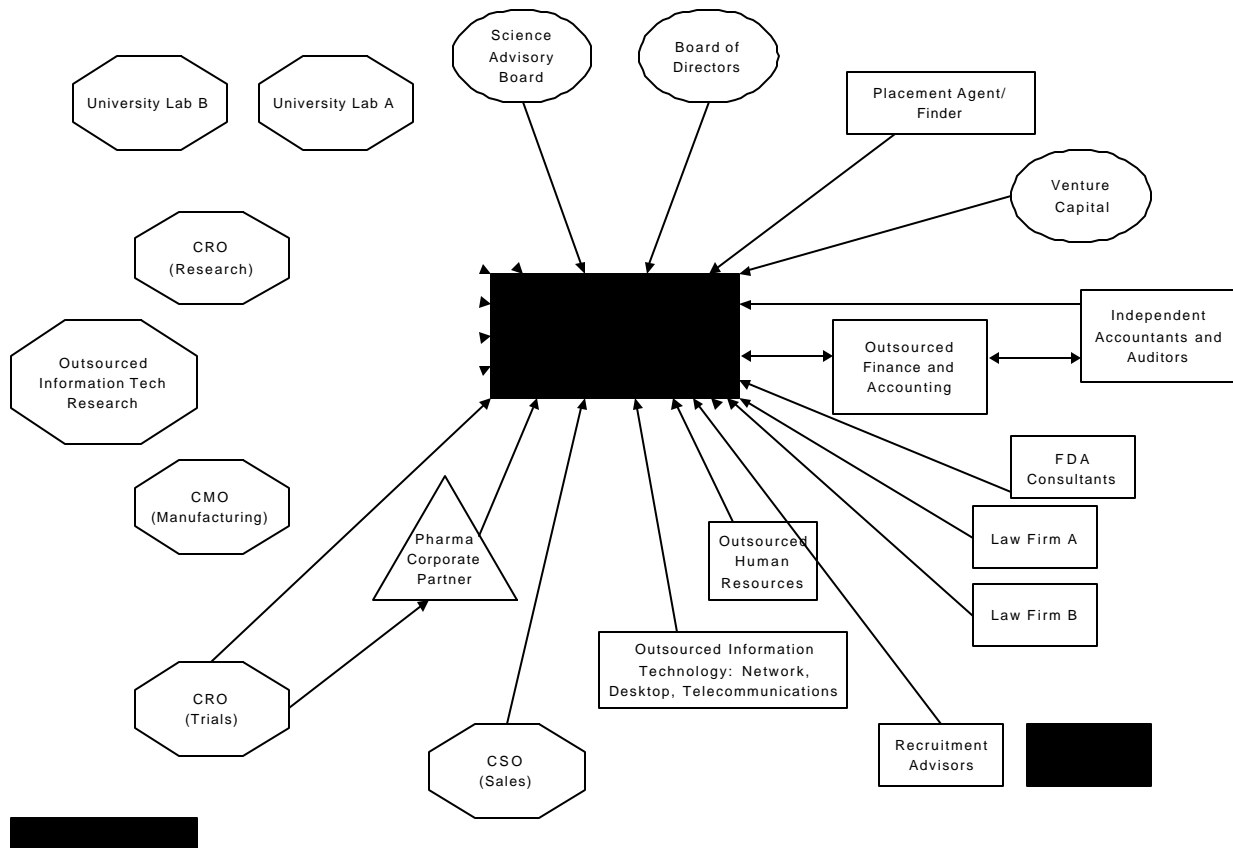
In view of the limited nature of the targeted literature the author hosted a workshop to discuss the topics in this paper at a biotech industry conference held in San Diego, California, during September 2003. The results and conclusions of that workshop are included as an addendum to this paper.

### **Spectrum of outsourcing options for a biotech**

One reason to revisit the virtual organization strategy is the expanded spectrum of options for outsourcing in the biotech industry. As a result of innovations in information technology and increased opportunities for global commerce, new service categories and suppliers have entered the marketplace. Today a biotech company can seek to outsource resources that needed to be integrated just a few years ago. Chart 2 illustrates the current spectrum of options.

Outsourcing arrangements can be one-off, selected service arrangements or they can be long term transactions where whole business units or functions of companies are transferred to a service provider, who then fulfills the “outsourced” function pursuant to a services agreement. There has been much written on the possible structures and advantages/disadvantages of outsourcing.<sup>vii</sup> The evolution of the industry, particular in the field of information technology outsourcing, has resulted in a wealth of practical and technical experience on how best to evaluate and execute on these opportunities. There is a large body of knowledge and information that any company contemplating an outsourcing transaction can tap into and communities within the outsourcing industry that are set up to share that knowledge.<sup>viii</sup> It is important to learn from that existing body of knowledge and experience in order to successfully execute on an outsourcing strategy.

Chart 2: Virtual Biotech Company – Outsourcing Options



Most people in the biotech industry will be familiar with some of these forms of outsourcing but may never have used the term outsourcing to describe these relationships. For instance, Sponsored Research Agreements between a biotech company and a university often go hand-in-hand with a license from that university to the biotech company of core technology and intellectual property rights. For purposes of this discussion the Sponsored Research Agreement is being characterized as an “outsourcing” to the university of work that would otherwise have been carried out by the company after establishing the necessary integrated resources (i.e., leasing lab space and hiring researchers). In reality the biotech company often has limited choice but to enter into the Sponsored Research Agreement, either because it is part of the bargain for the university license, because the inventor/primary investigator is not interested in leaving academic research to join the company or because the company does not have the capital to build the research facilities. In addition to sponsored research at universities, biotech companies have also outsourced research services, clinical trials, and manufacturing, distribution and sales for many years. However, the choices are now much broader because of the following factors and trends:

- Outsourced IT Services for Biotech:** As the biotech industry's requirements for information technology have expanded, so have the types of service offerings available to meet those needs. The mapping of the human genome has required huge data processing capabilities and extremely complex clustering of processing power. New drug discovery and product development techniques based on computer modeling is fueling further IT infrastructure build up to meet the potential

demand. For a biotech company, developing the necessary database and data mining technologies and building the huge computing power necessary to process vast quantities of information is not a viable or rational path. Instead, the biotech can leverage the core competencies and constant technology improvement of other organizations that do specialize in IT. Various IT companies have moved into the market to meet this anticipated demand. In the late 1990s companies such as IBM, HP, Oracle and Sun started developing dedicated “Life Sciences Solutions” business units that include sets of services focused on biotechnology<sup>ix</sup>. IDC estimates that the global market for Bio-IT infrastructure services will increase from around \$10 billion in revenues today to around \$30 billion in 2006<sup>x</sup>. The industry segment is sufficiently mature that it even supports its own focused publications, such as “Bio-IT World.”<sup>xi</sup>

- **Improved Communications:** As business theorists have explained, information technology and telecommunications are critical enablers of virtual organizations and outsourcing. The Internet, improvements in voice and data communications, and increased global trade have provided the platform for new and expanded outsourcing relationships.
- **Offshore Service Providers:** A significant trend in outsourcing is the shift of more and more resources from the United States to other countries<sup>xii</sup>. Such countries as Canada, India, Ireland, Israel, the Philippines, China and Singapore are offering services that compete directly with services offered by local service providers. Many of those countries have excellent technology resources and capabilities but dramatically lower costs for human resources when compared to the U.S. Thus the offshore suppliers can set drastically reduced pricing. Software development and back office operations, such as call centers, are examples of offshore outsourcing that have seen considerable growth in recent years and which present great potential for cost savings. Many of these offshore service providers are capable of providing 24/7 service, enabling US-based customers to get time-sensitive or critical services during their normal business hours and supplemental, development and maintenance type services outside their normal business hours.
- **Middle Market Focus:** A number of commentators have recently observed a move towards greater availability of outsourcing services to medium-sized and smaller companies<sup>xiii</sup>. They have identified a number of factors fueling that trend, including the following: (i) as larger companies have already completed “Mega Deals” with suppliers, the suppliers need to restock the pipeline with new outsourcing deals, at least until the next cycle of renegotiations and re-bids of the Mega Deals occurs; (ii) increased standardization within information technology environments allows for greater efficiency and confidence in pricing models, which in turn facilitates transactions with smaller total revenues to the supplier; (iii) new pricing methodologies, such as value pricing (e.g., sharing customer cost savings with the supplier) and utility pricing (discussed below) have given suppliers new incentives to focus on the middle market; and (iv) increased competition and range of service suppliers. As the majority of biotech companies are smaller to medium size operations, these trends mean that they will be more likely to gain the attention of service providers.
- **Business Process Outsourcing:** Many non-core functions within a company are in place to support the core strategic and revenue generating portions of the company. These functions include accounting, tax, legal, human resources, financial services,

procurement, warehousing, inventory, logistics and customer care. Although these functions may be essential for the operation of a business they are nonetheless cost centers rather than revenue centers. Outsourcing to a service provider that is in the business of providing the process may lead to otherwise unrealized efficiencies and cost reductions. For example, many companies outsource their payroll function to service providers such as ADP for exactly these reasons. Another factor may be the specialized nature of the process. A business may not use the process enough to justify having a resource dedicated to that specialty. A good example can be found with legal counsel. Specialist external legal counsel may be, in overall terms, much cheaper than maintaining integrated resources with that specialist background. While biotech companies will be very familiar with the use of professionals in the legal service sector, they may be less familiar with the services on offer for human resource and finance and accounting outsourcing. Such service providers as Adecco, Exult and Fiserv provide human resource services, while ALLTEL, CAP Gemni, CSL (Deloitte & Touche), and PricewaterhouseCoopers provide finance and accounting services. New suppliers and service areas are springing up all the time, so consideration should be given to alternatives that are now available.

- **Utility Pricing:** One of the fundamental problems with financing fully integrated resources is that the level of investment often does not correlate to the amount of usage required by the business. In other words, a lot of money is often invested in equipment that goes idle to some degree. In the virtual organization strategy all the investment in the resources and the risk associated with lack of utilization is shifted to the service provider. Realizing that level of direct linkage between usage and cost can be hard to achieve. For example many commentators on the IT marketplace have discussed the desirability of providing information technology resources, such as processing power, data storage and network bandwidth, on-demand in the same manner as utilities such as electricity, water or gas.<sup>xiv</sup> A few large IT service providers have already begun leveraging their economies of scale to provide outsourced utility computing services, which may be offered as components of a broader IT services package, or as stand-alone services.<sup>xv</sup> Utility computing is still at a relatively early stage and it will be some years before monitoring technologies and customer confidence in the pricing models will allow wide adoption. However, it is companies, such as biotechs, that have discreet research project needs that can be some of the early adopters of this paradigm<sup>xvi</sup> and this pricing approach is gaining some ground.

### **Advantages and Disadvantages of Virtual Organizations**

Fitzpartrick and Burke concisely summarize the main advantages and disadvantages of a virtual organization strategy in their Summer of 2000 paper entitled “Form, functions, and financial performance realities for the virtual organization.” The table below lists the main categories of advantages and disadvantages identified in their paper and its original sources, together with some of the disadvantages experienced by the author in the course of representing companies in outsourcing arrangements:

## Virtual Organizations: Summary of Advantages and Disadvantages<sup>xvii</sup>

### Advantages

- Access to specialized knowledge and resources, worldwide
- Increased flexibility and speed
- Less investment in fixed assets
- Ability to scale operations
- Cost savings

### Disadvantages

- Reduced loyalty/unity of interest
- Loss of confidentiality/security
- Increased dependence on information technologies
- Dependence on suppliers and their stability
- Difficulties in forming and managing multiple contracts
- Loss of hands-on control and dependence on leverage (dominance)
- Management burden increased

### Advantages

In theory a virtual organization strategy provides the opportunity to access the best in class services and knowledge from around the world, rather than limiting the organization to the knowledge and resources of its integrated resources. Of course the reality is that knowledge and resources are not completely open and not necessarily available on reasonable commercial terms. Particularly in high technology fields such as biotech, the best knowledge and resources in a field may have ties to competing interests or organizations. For example, a researcher may be interested in only academic pursuits and pure science, and may not want to become linked to the R&D efforts of a particular biotech company. Alternatively, the researcher may have an existing confidentiality or exclusivity arrangement with a competitor which means that they are unavailable as a resource. The emerging biotech company may itself want to gain the same kind of commitments from its researchers, thus further contributing to a closed market for outsourced services. The outsourced services market for the biotech and pharmaceutical industries is maturing and the growth of specialist CROs and CMOs who are much less likely to agree to exclusivity commitments (as such commitments would limit their business) may mean that there is a more open market for such services in the future. In the meantime it is difficult to draw any generalizations, as each avenue of biotech research will have its own specific set of circumstances and much will depend on the specific nature of the work and what resources exist in that field. Some fields will have more research resources and alternative sources than other fields. So the author sees this as a potential advantage, subject to availability of resources in the particular field of interest.

It has been recognized that it is important for biotech companies to adopt a “fast fail” approach (i.e. to scrap an avenue of research and development as soon as indicators suggest it is unlikely to be successful). In theory the virtual organization helps facilitate a

fast fail because such an arrangement shifts to the service provider much of the risk and cost associated with setting up and shutting down areas of activity, thus obtaining flexibility without extensive failed project costs. While this can be achieved to a degree through outsourcing arrangements the reality is that the service provider will often not be prepared to accept all the costs and expenses of a terminated service. The service provider will usually ask for a long term contract and want financial compensation if the customer elects to terminate early. This is partly so that the service provider can recoup some of the initial investment it will have made in the sales, setup and transition processes together with the costs of the wind-down, but also because the service provider wants to see some guaranteed profit on the arrangement. For services where there is a mature market and multiple service providers, the customer will generally be more successful in avoiding such charges and commitments. For highly specialized or unique services, it may well be difficult to offload all the termination and transition risk to the service provider. Much will again depend on the specific circumstances and the virtual organization's success in negotiations with service providers. Despite these caveats it should be possible to achieve some degree of shifting of the termination and transition risk through outsourcing (as the service providers are ultimately in a much better position to redeploy equipment and resources than a fully integrated company) and thus this is a potential advantage of such an arrangement.

The ability to leverage the existing capital investments of service providers is clearly one of the main advantages of a virtual organization strategy. This is particularly true in the biotech and pharmaceutical industries where the capital required to build fully integrated labs, manufacturing capabilities and international sales forces is beyond the reach of all but the largest companies. If the biotech company's products need to be made in any substantial volume, then it is likely that the biotech company will have little choice but to either outsource manufacturing to a CMO or to partner with a pharmaceutical company who has such manufacturing capabilities. Similarly, it would be an inefficient and probably ineffective use of resources and capital to build a sales force for an emerging biotech company's initial products, and so it would make much more sense to either contract for these services or partner with a pharmaceutical company that has such resources already integrated into their organization. On a similar theme, the biotech may have no choice but to outsource or partner to achieve increased scale to their operations. While scaling for an outsourced service provider or partner will take planning, the obstacles will be much more manageable for them than for the biotech if it were to tackle those obstacles on its own.

Last, but certainly not least, cost savings. In many respects this is often the key driver for outsourcing strategies and in some cases can become an overriding objective (i.e., achieve cost savings even if it means sacrificing other objectives). The author has found it difficult to find information and data on what the relative cost savings might be for outsourcing such services as biotech research and development. In part this is because the comparisons that need to be made are often difficult to make due to the specialized nature of the services and the lack of baseline equivalents (e.g., if the biotech doesn't have integrated manufacturing capabilities, how can it compare the internal versus external costs of manufacturing?). In areas, such as information technology outsourcing where historical experience and data exist, more reliable information can be obtained as to the relative cost savings that might be achieved. In some cases cost savings guarantees are even built into the service contract. Often the pricing will be set at fixed amounts so that customers have certainty as to their expenditures provided they stay within contracted volumes of services. Thus while it is difficult to give any definitive view as to the relative strength of this perceived advantage in the context of a biotech company, it is safe to say that outsourcing could present overall cost savings, particularly in service areas that have more mature markets,

and that at the very least an outsourced arrangement could lead to more definition as to costs.

### **Disadvantages**

Nearly all the writers on the topic of the virtual organization strategy point to the potential for loss of loyalty and lack of unity of interest in the virtual organization. The point being that with so many actors in the company's value chain being independent contractors with differing interests to the company, it is much more difficult to build a common purpose and to overcome operational difficulties through unified action. Stated simply, the actors in the value chain may not care as much about the success of the organization they are supporting. This author believes that these concerns are overstated. Firstly, the unity of interest amongst employees of a fully integrated organization is often quite limited. Every employee makes a commercial bargain to trade their hours of work for the compensation provided by their employer. Employees have differing interests to their employer (e.g., maximizing their compensation versus increasing the profitability of the organization). Even where employees have a significant ownership interest in an organization, that stake does not necessarily mean that the objectives of the organization will override the desires of the employees (e.g., witness the events of the last twelve months between airline unions and their employers). While much lip service is often given to "cultures" within companies and building a team spirit amongst a company's workforce, these influences are in many cases not as strong as the opportunism of the individual employees and merely create a superficial gloss over the true nature of the employee and employer relationship. Secondly, the supplier and customer do have alignment on many issues. The success of the customer's business can directly benefit the service provider in terms of new business from the customer, either directly from the customer or indirectly through referrals or good testimonials. There is also a movement in outsourcing relationships towards more "transformational" relationships where the service provider's success is measured more by metrics assessing the customer's underlining business rather than the service provider's delivery of services. The overall philosophy behind such transformational outsourcing is that the customer and the service provider are getting into the "same boat together" and that this increased alignment through service levels measured on the success of the underling business of the customer leads to a stronger relationship.

Commentators also point to diminished trust and commitment as being factors that undermine the unity of interest among actors in the virtual company model. However, trust and commitment can be built over time with external suppliers. As a recent article about JC Penney outsourcing its inventory management to its offshore apparel manufacturer illustrates, initial concerns over relying on an outside contractor to perform a non-core, but critical function can be overcome through a steady build up of the outsourced arrangement and successful commercial results.<sup>xviii</sup> Certainly an organization's values and goals can be powerful forces in driving employees to perform to the highest levels and such forces are an essential part of building any early stage and rapidly growing company. However, the concern that outsourcing arrangements may not work because they will be lacking in this dimension is of little real impact provided that it is remembered that some degree of alignment of interest should be a central part of any outsourcing relationship.

Security and confidentiality considerations present real challenges for any outsourced arrangements. Extending the sharing of sensitive information to service providers inevitably involves more risk, particularly as the service providers are likely to be working for competitors of the organization, or may themselves become a competitor using the

information if appropriate controls and restrictions are not put in place. Customers do not have operational control of the information when it is in the hands of their service provider and thus are reliant on service provider's practices and promises as to how they will protect the information. When dealing with service providers in other countries the risks can be increased yet further due to additional vulnerabilities in the means of information exchange, cultural differences with regard to confidentiality and socio-political stability of the country in question. However, there is also inherent risk associated with sharing and management of information even amongst fully integrated employees of a company and these risks can be managed in an outsourced arrangement. Information security policies and practices require planning and coordination and the involvement of a service provider means that the planning efforts need to incorporate the service provider. Often times the service providers actually have more advanced and secure practices than the customer, as information security may be one of the service provider's core competencies. So while this concern is real, it can be overcome with appropriate planning and attention.

Information technology has become the critical enabler for increased outsourcing and reliance on IT has increased. The risks here include the potential loss of means of communication and the costs and burdens of maintaining information technology. With any outsourced arrangement the business case for the arrangement must take into account any additional communications and information technology costs and risks. In many instances, these costs will be adequately covered by the cost savings or strategic benefits of the arrangement. Also the Internet, which is the backbone of much of the communications in question, has proven itself to be one of the most resilient means for communication. As most outsourced arrangements will have multiple means for achieving communication, this area of risk is again quite manageable.

A more general concern regarding outsourcing is that the customer will become too reliant on the supplier. In addition, if the supplier were to go out of business or get into financial distress, the provision of services could be adversely effected. There is substance to these concerns and potential for costly problems if the risk is not managed. Suppliers may use the customer's dependency as a means to extract greater benefit from the relationship. If a supplier goes out of business or files for bankruptcy protection the customer may be either left with a loss of service or a continuing contract with a supplier who is distracted and losing resources.<sup>xix</sup> The key to managing these risks is to maintain sufficient flexibility in the contractual arrangements with the supplier so that the customer can exit the arrangements when it has clear indication that it will be negatively impacted by the supplier's situation. Maintaining sufficient transition planning so that the customer retains the option of moving to alternative suppliers is also vital. Termination rights are only effective if the customer can actually follow through on any threat to take away the business from the supplier. Thus the customer has to devote sufficient time and attention to contingency and transition planning to ensure it has an achievable exit strategy even if they have no current intention of exercising that right. It should also be noted that the fully integrated company has analogous risk and dependency with its employees. The loss of a key employee can have a devastating impact on a company. The key employee might also use the company's dependency on them to extract additional compensation or other terms. Thus, with both external and internal resources an organization must devote some time and effort to managing its dependency on such resources.

To move from the current practice of selective outsourcing in the biotech industry to a fully virtual organization, biotech companies would have to increase the number of their contractual arrangements and seek to have those arrangements work with one another.

One problem is that the suppliers will need to interface with each other and those interactions can lead to confusion, missed responsibilities and disputes. As can be seen from Chart 2 above, the virtual organization will have a myriad of different relationships and in many cases those relationships and the contracts that govern them need to be coordinated. For instance, many of a company's non-core functions that can be outsourced are dependent on information technology to support their service delivery (e.g., human resource outsourcing would be dependent on appropriate maintenance and availability of electronic employee records). Failure to adequately address the needs of other dependent services in the contracts that govern an outsourced service could seriously undermine the benefits of the two sets of arrangements. To some degree outsourcing arrangements are only just starting to tackle this issue. Flexibility, in terms of being able to change or terminate service arrangements, is key to tackling these issues. Adding special contract provisions that require suppliers to cooperate and coordinate with other third party suppliers are also being proposed and negotiated. Probably the most important thing is for the customer to envisage an overall strategy for their outsourcing, so that to the greatest extent possible they can identify areas of common dependency between suppliers and address those points in the contract established with each supplier.

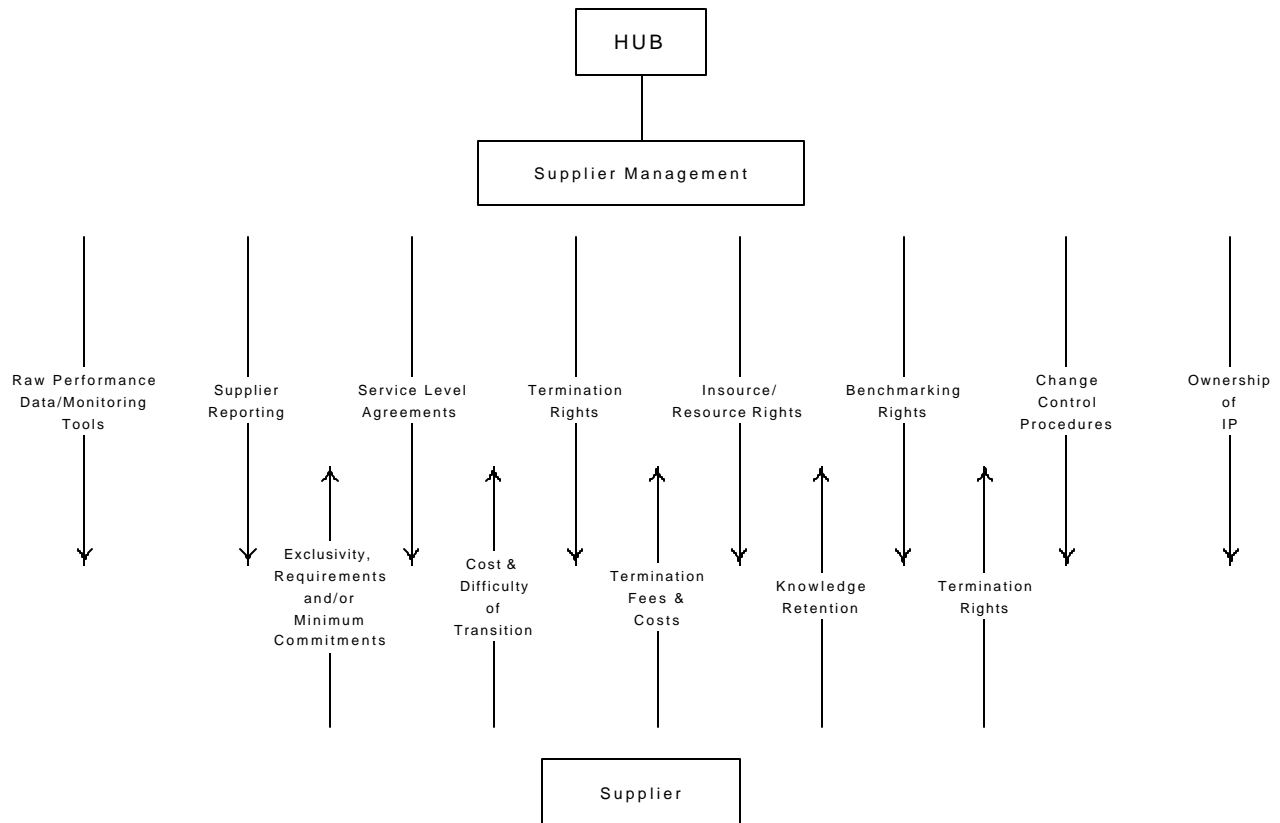
Loss of control and management burden are issues that need to be addressed in outsourcing and fall within the broader category of governance of the outsourced arrangement. It is necessary with any outsourcing arrangement that the customer give up some degree of control to the supplier and the need to retain hands-on control can be a significant factor in decisions not to outsource. However, if the function is non-core, the question becomes does the loss of control really matter if the right end results are achieved? Shouldn't the focus be on control of the end results rather than the control of the process that achieves them? Control of the end results often depends on the leverage (also known as dominance) of the customer. Dickerson discusses<sup>xx</sup> the importance of "dominance" in the relationship between the customer ("hub") and the suppliers to a virtual organization. It is undoubtedly a key factor in achieving success in any outsourcing arrangement and the following section of this paper discusses some of the main ways in which this can be achieved. Dominance may be difficult to maintain and the customer may have differing degrees of dominance in particular arrangements, but with careful planning and structuring dominance can be maintained. Outsourcing does require dedicated and focused management personnel within the customer organization and lack of customer management of the relationship is often noted as one of the primary reasons for the breakdown in outsourced arrangements. Recognition of this fact has created supplier management functions within organizations who become subject matter experts on the issues and challenges involved in successfully managing multiple suppliers. What is unclear is whether these are additional management burdens purely associated with outsourcing or just recharacterized burdens that already existed. It may be that this managerial function merely replaces the one that would have existed to manage internal resources. In any event, if the business case for outsourcing includes the costs of maintaining sufficient supplier management functions, then even some increased management burden would still be a worthwhile cost to achieve the overall benefits.

### **Hub Dominance: Supplier management is critical**

The diagram on the next page illustrates a "hub", representing the core functions of the virtual biotech company, and the supplier who provides a service. The hub uses a layer of internal resources as the supplier management function of the virtual organization. The interactions between supplier management and the supplier are impacted by various factors

that largely emanate from the outsourced services contract. The hub's degree of dominance will be governed by the number of arrows that it has at its disposal and the extent to which it can avoid a contract that gives the supplier its own set of arrows.

Chart 3: Governance – Maintaining "Hub" Dominance



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The contract provisions highlighted in Chart 3 are summarized below. As the following examples demonstrate, the degree of dominance in a hub/supplier relationship can be materially impacted by the terms of the contract. The author also suggests ways in which the “hub” can maximize its dominance through careful negotiation of such provisions and how the maturity of the outsourcing industry has provided tools and practices which facilitate a virtual organization strategy.

### Provisions that maintain dominance

- **Termination Rights.** Prior to engaging outsourced resources the customer has the ultimate leverage and flexibility of choice: if a supplier does not provide what the customer wants the customer can choose the supplier's competitor. Market forces, supply and other factors may limit the decision, but usually the customer is in the driving seat. That degree of dominance in favor of the customer would ideally be preserved during the life of the outsourcing arrangement so that the customer could

again chose to move to a supplier's competitor if it was no longer satisfied with the incumbent supplier's services. This degree of flexibility is often not possible. The supplier will usually make an upfront investment in the outsourcing arrangement that it will need to recoup over time. Thus the supplier will demand that the customer provide some degree of long-term commitment to the relationship. In the context of sole sourced information technology outsourcing this has often meant a commitment by the customer of between seven and ten years in length. This issue will need to be analyzed and addressed with each arrangement and a fair balance struck between the considerations of the customer and the supplier. The customer should certainly strive for as much flexibility as possible and that should manifest itself in a number of potential ways in the contract. Firstly, the ultimate term of the contract should be shorter rather than longer. Secondly, the contract should specify all of the circumstances under which a customer may terminate the agreement and the financial consequences, if any, resulting from such termination. In an ideal situation this would include rights for the customer to terminate for convenience at any time, without cost. More likely is a set of specified situations that would warrant a termination (e.g., breach by the supplier, service level failures) and a right to terminate for convenience after a period of time upon sufficient advance notice to the supplier and reimbursement of the supplier's wind down costs. If a supplier has made investments in the customer or if the customer agreed to a significant amount of financial engineering as part of an outsourcing agreement (e.g., lower payments in early years and higher payments in later years), then the supplier will expect also to be made whole for this "loan" to the customer in the event of an early termination. Even if termination fees have to be accepted, it is still important for the customer to negotiate for these termination rights as the specter of termination is a powerful driver of supplier performance.

- **Insource/Resource Rights.** Similar to the right to terminate, the terms "insource" and "resource" refer to rights to recommence performance of the outsourced services with integrated resources ("insourcing") or to contract for a third party to perform the outsourced services instead ("resourcing"). This is often used for more incremental changes to the work given to the supplier. These rights are very useful, in particular because while a supplier may be meeting or exceeding expectations in certain areas of the services, there might be discreet areas where the customer would like to pursue an alternate solution.
- **Service Level Agreements.** Every outsourcing agreement should contain service level agreements (or SLAs) against which the service provider will be measured. If the customer does not have sufficient data upon which to establish service levels, or does not wish to take the time to collect such data, the customer should start by requiring the service levels to be at least as good as what the customer received prior to outsourcing and/or a mechanism should be included in the outsourcing agreement for determining how the service levels are ultimately established. If the service provider fails to meet the mandated service levels, the customer's remedies should include the reduction of the service provider's fees (performance credits), the ability to insource or resource the service(s) at issue, and/or the right to terminate the affected service(s) or terminate the entire outsourcing agreement. Service level arrangements have been commonplace for years in information technology outsourcing and standards are now much easier to set because of standardization in practices. For other areas of outsourcing, particularly those where there is less standardization in processes, the establishment of performance levels may be more

difficult. This is one area where the biotech industry could use more planning because the industry's current outsourcing arrangements tend to have relatively few performance measurement provisions.

- **Raw Performance Data/Monitoring Tools/Supplier Reports.** A customer's ability to manage the supplier is highly dependent on the degree to which the customer has information concerning the supplier's performance. Setting mutually agreed means to measure performance and monitoring results against required levels of performance gives both customer and supplier an objective basis on which to assess the success of the relationship. The supplier should regularly report on its performance and the customer should have access to those reports and the underlying data to make its assessment of that performance.
- **Benchmarking.** It is now increasingly common for outsourcing arrangements to include a provision that allows the customer to periodically request that the prices, services, service levels and other terms of the arrangement be compared to those currently available in the marketplace. Although the effectiveness of these "benchmarking" processes is open to debate, they do at least provide another pressure point that a customer can use to drive behavior by the supplier. Suppliers will generally resist such provisions or design their operation such that it is impractical for the customer to get an effective result. However, provided a customer is aware of the drafting loopholes and incorporates a provision that provides at least some opportunity for re-evaluation of the supplier, these provisions can prove to be useful.
- **Change Control Procedures.** It is inevitable that change will be required in any outsourcing arrangement. Particularly for longer-term arrangements, it is impossible to accurately predict all the needs and requirements of the customer, or how they will change over time or be impacted by changes in the marketplace. Thus a successful outsourcing arrangement needs to include a procedure by which change can be assessed and dealt with. Certain types of changes and variations should be built into the arrangements with preset adjustments to the terms to take care of their impact. For instance, certain changes to volume of services or deadlines for delivery could have a predefined cost impact in terms of adjustments to the prices for the services. Other more fundamental changes to the services require a process for assessment and negotiation of the applicable contract changes. Having these procedures clearly established will enable the customer to maintain some degree of dominance even when change is subject to negotiation, because the customer will at least know what the change process is and when it has been exhausted. The end of the change control process may trigger rights for the customer to go elsewhere for the changed services.
- **Ownership of IP.** Intellectual property ownership is often one of the most heavily negotiated terms of any outsourcing arrangement. Customers need to determine what ownership regime they wish to establish with their service provider. Some customers demand ownership of all of the intellectual property developed under an outsourcing agreement, regardless of whether the service provider developed the IP alone or together with the customer's employees. On the other hand, service providers often demand ownership rights or at least a license arrangement so that the service provider can use the intellectual property internally or to provide services for other customers. To the extent ownership vests in the service provider, the

customer needs to ensure that it receives sufficient rights to use such IP during and after the term of the outsourcing agreement and what restrictions, if any, should be placed on the supplier's use of the IP. To the extent ownership vests in the customer, the customer may have influence over the supplier as a result because if the supplier later needs to use the IP for another purpose it must first ask the customer for a license. The customer might use the supplier's need for additional rights to the IP as leverage to gain some other concession from the supplier. Defining which party owns various types of IP, and how each party and each type of IP may be used, is important for any outsourcing arrangement. Careful analysis of the core and non-core strategic issues for the customer will help determine what ownership regime is right for the customer. If a customer can obtain ownership of IP, then those ownership rights may give the customer an additional sphere of influence over the supplier.

### **Provisions that reduce dominance**

- **Exclusivity/Requirements/Minimums.** Customers should not enter into an exclusive relationship, requirements contract or minimum purchase commitment with a supplier unless faced by some compelling need to use just one specific supplier or the customer receives such huge price concessions that it justifies the loss in flexibility. While certain arrangements may by their very nature necessitate that the customer commit to purchase a certain minimum volume from a supplier, a customer should always maintain the flexibility to buy services elsewhere if at all possible (see discussion above).
- **Transition Issues.** Once a customer has established a long-term relationship with a supplier there is always some degree of dominance that is lost because of the costs in effecting a change to an alternative provider. The incumbent service provider is well aware of this factor and may seek to further cement their position by requesting automatic renewal terms and failing to assist the customer with transition planning and arrangements, unless expressly required to do so in the contract. This should be resisted and instead detailed transition assistance obligations placed on the supplier.
- **Termination Fees and Costs.** Another barrier that a supplier can establish to deter termination by the customer is termination fees and costs. If the supplier can either establish high termination fees or create enough uncertainty as to how they are to be calculated, it can achieve a chilling effect on the customer's termination plans. If termination fees have to be accepted, then they should be set forth in terms of actual payment amount by service and by year in a schedule to the contract.
- **Knowledge Retention.** The supplier will often know a great deal more about how to operate a function in the customer's business than the customer. Unless provisions are added to the contract to facilitate knowledge transfer to the customer, the supplier can use the fact of their retained knowledge of the customer's business as another factor in diminishing customer dominance. To counter this an express provision requiring periodic knowledge transfer to the customer should be included in the contract.
- **Supplier Termination Rights.** The supplier may request termination rights, particularly to counter the rights requested by the customer. A supplier termination

can be damaging to a customer because of the disruption, distraction and transition costs it can cause. Thus from the customer's perspective these rights should be kept to a minimum and generally should be limited to termination for customer's failure to pay.

The provisions in the contract with the supplier will not be the only driver of performance. However, what the above examples illustrate is that there are means within a contract to add mechanisms and devices that can maintain the customer's dominance and thus help the chances of a successful outsourcing arrangement.

## **Planning**

With knowledge of the options available and an understanding of how to manage and control the potential disadvantages, the architects of a biotech company can better assess whether a virtual organization strategy is right for their business. As it is much easier to establish an outsourced service arrangement at the beginning rather than transitioning from existing integrated resources later on, there is much to be said for planning at the outset the role of outsourcing and the degree to which the company will pursue a virtual strategy. Part of the planning will start with a decision as to what are the core and non-core functions within the company. This decision may not be a simple one for a biotech company. For instance, is the further research and development of the company's technologies a core function? As we can see from Chart 2 there are many opportunities for outsourcing a portion or all of the research and development functions and it could be argued that the core competencies of a biotech company are the identification and assessment of research candidates, and not the carrying out of the research work itself. Thus outsourcing research may well be the best approach. Biotech entrepreneurs will make differing decisions on this point, but if the virtual organization strategy is to be pursued then as much of the research and development work as is possible should be outsourced. Other functions are much more clearly non-core, such as legal services, finance and accounting and human resources. Here the decisions to use an outsourced solution should be more straightforward, although the task of managing the suppliers may present their own difficulties. Planning in the form of research as to the different suppliers available, seeking references and setting performance metrics will be important. Creating an overall strategy for the use of outsourced services will also help in terms of building suitable cooperation provisions into each of the contracts to ensure that all the suppliers work together as seamlessly as possible.

## **Conclusions**

The organizational structures used by biotech companies today are at one step on the evolutionary ladder towards a truly virtual corporation. A virtual organization strategy does appear to present potential efficiencies and advantages for building a biotech company, and with an ever-increasing range and number of suppliers, there are good reasons for giving the strategy renewed consideration. Appropriate planning, structuring of contracts and management of suppliers are all critical to realizing the strategy and making it work. Experience in dealing with those issues has provided a number of contractual devices and mechanisms that can be employed to the biotech company's advantage. While outsourcing more non-core, critical functions may involve going against established norms in practice and take some explaining to employees and investors, the basic business case for doing so may be quite compelling. With investment dollars for new biotech ventures a scarce commodity, entrepreneurs should consider building more outsourced services into their business strategies and business plans. Detailed discussion of the benefits and business case for doing so will help

overcome resistance to change. In fact, entrepreneurs may find that investors react positively to a business venture whose business model compliments the inventiveness of its core technologies and whose management team are focused on minimizing capital expenses and exploring the best and most efficient means to achieving the company's goals.

**Addendum: Remarks and Conclusions from Workshop  
held at the 4<sup>th</sup> Annual Business of Biotech Symposium & Expo  
Carlsbad, CA September 28, 2003**

A workshop was held at the 4<sup>th</sup> Annual Business of Biotech Symposium & Expo on September 28, 2003 to discuss the topic of this paper. The workshop used a fact pattern based on a fictitious virtual biotech company called Virtugen as a reference point for the discussion of the merits and possibilities of a virtual organization structure. The workshop was lead by the author and four “actors” who played the roles of the CEO/Founder, Chief Scientist/Founder, venture capitalist investor and regulatory counsel for Virtugen. Approximately thirty people from the biotech industry attended the workshop, including founders of biotech companies, representatives of outsourcing service providers, investors, scientists, a journalist, a regional development leader, consultants, an accountant, and lawyers. The workshop lasted three hours and was split into two sessions: the first session covered an introduction to the topic and general discussion concerning the applicability of the virtual organization; the second session covered discussions of specific proposals for outsourcing clinical research and clinical trials, outsourcing heavy computer modeling needs, outsourcing operational IT needs and outsourcing human resources, finance and accounting. The following is a summary of the main points arising from the discussion:

- **Mixed Feelings Towards Outsourcing to CROs.** There was a good deal of skepticism amongst the audience members as to the advisability of increasing the amount of outsourcing to CROs. Important concerns expressed were that a virtual organization would have insufficient credibility within the life sciences industry if it were to rely entirely on outsourced research work. In particular, potential corporate partners would be put off and question the quality of the data produced from such arrangements. Others felt that CROs would not have the requisite incentives to produce the best work possible and would not necessarily have the best resources. One specific area of concern was the ability of CROs to design the studies and models for the research work, it being one commentator’s view that such design work has to be done internally within a biotech by the scientists who are intimately familiar with the technologies. There was some recognition that CROs may have some cost advantages, but there were also view points expressed that those savings might be outweighed considerably by the “quality” and “credibility” concerns and by the lost opportunity cost of an unsuccessful arrangement with a CRO. There were concerns expressed about the ability of companies to monitor and control the CRO’s performance under the outsourcing arrangement, although there was also recognition of the fact that the outsourcing contract could create some discipline to the process which might be lacking in an internal development effort. There was some agreement that selective use of CROs to supplement the work of the internal development team could be very beneficial, provided that the above concerns were addressed to the greatest extent possible.
- **Regulatory Concerns: Potential impact to FDA process.** Regulatory counsel advised that it was important to “think backwards” in relation to outsourcing proposals. In other words, it is crucial to think of the long term effects of outsourcing arrangements and how they might impact the company’s ability to meet its regulatory obligations and deal successfully with the FDA. For example, despite the recent guidance from the FDA on 21 CFR Part 11 (concerning electronic records) there was still a great deal of uncertainty as to the standards that would be required to comply and that it was unlikely that any service provider could promise with any degree of certainty that they were “Part 11 Compliant.” Regulatory Counsel’s view was that a company was better off keeping

direct control of electronic records to avoid problems in terms of forcing a third party service provider to take steps to address regulatory concerns. It was agreed that regulatory concerns would have to be carefully addressed in any outsourcing arrangement for a biotech and that the costs that could be caused by getting this wrong could greatly outweigh the potential economic benefits of an outsourcing arrangement.

- **Strategy has to be right; focus should not be on tactical decisions.** One commentator pointed out that organizations such as Virtugen had to determine a strategy for the company as a whole before it could answer such questions as whether to be a virtual organization or not. The strategy would then drive much of the tactical decisions on how best to implement the strategy. The commentator also noted that outsourcing transactions could easily get bogged down in tactical decisions and that it was easy to lose sight of the overall strategies. It was also noted that extensive outsourcing arrangements could be an impediment to some strategic transactions (e.g., if the company had extensive CRO and CMO arrangements, then that might deter a potential corporate partner from entering into an alliance or acquisition). There was some debate as to whether outsourcing arrangements were helpful or a hindrance to such exit events. It was generally agreed that it all depended on the particular outsourcing arrangement and it was noted that a well drafted outsourcing contract should adequately address these eventualities.
- **Core Competencies of a Biotech: Anything that leads to Intellectual Property?** In the course of discussing a definition of the core competencies of a biotech company it was suggested that this definition may be as broad as to include any activity that results in the development of intellectual property. This conclusion would suggest that a biotech company should not be outsourcing any of its research, development or optimization activities as those are the activities at the heart of intellectual property creation. There were views expressed that this takes the core competencies of a biotech to an extreme level and would ignore the realities of the limited financial resources available to most biotech companies. However, the overriding importance of the company's intellectual property means that outsourcing may not be advisable for services likely to involve the company's intellectual property. At the very least, where a service provider is to have access to the company's intellectual property there should be the strongest possible contractual protections imposed on the service provider to avoid loss of intellectual property and intellectual property rights.
- **Speed is critical.** Some commentators did note that outsourcing arrangements could be very important in speeding up the development and clinical trials processes and that speed to market would usually be an important factor for any biotech company.
- **Financial Realities may necessitate outsourcing.** It was recognized that limits to a company's financial resources may necessitate some degree of outsourcing, because the company would not have the capital to invest in building the necessary integrated resources. It was noted that a selective outsourcing approach could lead to a suitable balancing between the concerns noted above and the realities of the company's balance sheet. In addition, the expansion of the number of players in the CRO and CMO markets mean that there are now increased opportunities to conduct outsourcing.
- **Information Technology Outsourcing is a special case.** It was generally recognized that there were very good practical and technical reasons for outsourcing the information technology needs of a biotech. Particularly in relation to research related information

technology needs there are benefits in leveraging the technical prowess and resources of information technology companies. There was also a general willingness to consider operational information technology outsourcing, though there were some questions concerning whether most biotech's were of a scale that they could attract the attention of service providers for such operational level outsourcing.

- **Business Process Outsourcing.** There was a good deal of interest in learning more concerning the possibilities for outsourcing business process functions such as human resource management, finance and accounting. There are service providers who are now entering the market who are focused on providing such services specifically for biotech companies (there were at least two such service providers in the audience).
- **Outsourcing Outside the US.** It was noted that the possibilities for outsourcing to other countries are very interesting and the audience was interested to learn more. However, the concerns expressed above could be exaggerated yet further with offshore outsourcing. The availability of good scientific and technical resources in other countries mean that offshore outsourcing could be useful and potentially an increasingly popular option for biotech companies. There was a representative from an offshore CRO in the audience, as well as scientists from outside the US. A question was raised as to whether offshore service providers would generally have the same quality as outsourced service providers in the US. It was pointed out that in certain fields, such as software development, offshore service providers have demonstrated themselves to be as good if not better than the majority of US based service providers (e.g., 80% of CMM Level 5 software developers are in India). It was noted that there were already good CMOs in offshore locations and that it was probably just a matter of time before other countries possess competitive companies in the CRO space.
- **Security and Confidentiality Key Issues.** There was discussion as to whether outsourcing arrangements heighten or potentially address the concerns related to information security and confidentiality. Some commentators noted that the introduction of a third party service provider inevitably meant that there were additional levels of risk introduced in relation to information security and confidentiality. Others noted that service providers often had more sophisticated information security policies than their customers and that they could help introduce best practices into an organization.
- **General Conclusions.** While a virtual organization strategy may be unworkable in its purest form, there are some interesting opportunities to consider in relation to outsourcing in the biotech industry and companies should consider those opportunities, albeit with an appropriately cautious and measured approach.

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- <sup>i</sup> See Fitzpatrick and Burke (2000) and Harrigan (1984) in bibliography for discussion of these four strategies.
- <sup>ii</sup> See Fitzpatrick and Burke (2000).
- <sup>iii</sup> See Fitzpatrick and Burke (2000).
- <sup>iv</sup> See Dickerson (1998) page 763.
- <sup>v</sup> For example in “RegioN” in Lower Saxony (Germany) “Bio-Tech Region” in Munich (Germany), Geneva (Switzerland), and “Medicon Valley” (Denmark-Sweden).
- <sup>vi</sup> [www.uni-lueneburg.de/fb2/bwl/mut/daten/virtual\\_biotech\\_company.pdf](http://www.uni-lueneburg.de/fb2/bwl/mut/daten/virtual_biotech_company.pdf)
- <sup>vii</sup> See Global Information Technology Outsourcing by Mary C. Lacity and Leslie P. Willcocks (2001); Turning Lead into Gold: The Demystification of Outsourcing by Peter Bendor-Samuel (2000); Strategic Outsourcing: A structured Approach to Outsourcing Decisions and Initiatives by Maurice F. Greaver (1999); Outsourcing: A Guide To...Selecting the Correct Business Unit...Negotiating the Contract...Maintaining Control of the Process by Steven M. Bragg (1998); Outsourcing Information Technology Systems and Services by Robert Klepper and Wendell O. Jones (1997).
- <sup>viii</sup> See Technology Partners International, Inc. (TPI), <http://www.tpi-sourcing.com>; The Outsourcing Institute, <http://www.outsourcing.com>; Outsourcing Research Center, <http://www.cio.com/research/outsourcing>; The Everest Group, <http://www.outsourcing-consulting.com>; META Group, <http://www.metagroup.com>; Gartner, <http://www.gartner.com>.
- <sup>ix</sup> See <http://www-3.ibm.com/solutions/lifesciences/solutions/biotech.html>
- <sup>x</sup> IDC “Bio-IT Infrastructure Report 2003.
- <sup>xi</sup> <http://www.bioitworld.com/>
- <sup>xii</sup> See Kahn, G (2003) and Meredith, R. (2003).
- <sup>xiii</sup> See Ross (2003) and Joseph, S (2003).
- <sup>xiv</sup> See Larry Dignan, *IT's Buying “Utility” Computing*, CNET NEWS.COM (October 21, 2002), available at <http://zdnet.com.com/2102-1106-962663.html>; Larry Greenemeier, *Is E-sourcing the next wave?*, INFORMATIONWEEK (August 13, 2001); Hewlett-Packard Utility Pricing Summary, available at <http://www.hp.com/products1/unixservers/solutions/utilitypricing/>; e-Business on Demand: The Next Utility, IBM Global Services, available at [http://www-1.ibm.com/services/ondemand/index\\_flash.html](http://www-1.ibm.com/services/ondemand/index_flash.html).
- <sup>xv</sup> For example, IBM advertises a wide range of utility computing options, such as Linux Virtual Services, where customers consolidate Unix and Intel systems on a network-based Linux server, paying only for the portion of processing power they use. Sun Microsystems has also launched utility computing service offerings based on its N1 software, which would create virtual mainframes out of a company's existing computer resources, and Hewlett-Packard has begun offering utility computing services as well.
- <sup>xvi</sup> See Larry Greenemeier, *IBM Readies E-Business On Demand Supercomputing Facilities*, INFORMATIONWEEK (January 9, 2003), available at <http://www.informationweek.com/story/IWK20030108S0013>. For example, Petroleum Geo-Services ASA, a Norwegian provider of marine seismic data, onshore surveying, and oil and gas production services mainly in the North Sea and the Gulf of Mexico, will be IBM's first customer at its new E-business on-demand facility in Poughkeepsie, New York. Petroleum Geo-Services will use IBM's on-demand services to process data and images as part of a three-month deepwater exploration project in the Gulf of Mexico. Petroleum Geo-Services expects to save \$1.5 million annually using the new services, with much of the savings coming from not having to lease its own Unix servers to do heavily computational work in-house.
- <sup>xvii</sup> Table based in part on summary compiled by Fitzpatrick and Burke in their Summer of 2000 paper entitled “Form, functions, and financial performance realities for the virtual organization.”
- <sup>xviii</sup> See Kahn, G (2003).
- <sup>xix</sup> Under US Bankruptcy law the trustee in bankruptcy for a supplier estate can elect to continue the contract notwithstanding the supplier's filing for bankruptcy. Provisions entitling the customer to terminate the arrangement due to the supplier's bankruptcy are often unenforceable.
- <sup>xx</sup> Dickerson, C.M. (1998).

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