Master’s Thesis:

Corporate Governance in the Biopharmaceutical Industry

Elements that make up a good system of corporate governance of biopharmaceutical firms

Author

Morten Blegvad
MSc in Applied Economics and Finance

Supervisor

Aleksandra Gregoric, Associate Professor, PhD
Department of International Economics and Management

Pages: 78.26 (178’040 characters)
Executive Summary

The little existing research on the biopharmaceutical industry indicates that it as a whole is highly unprofitable, which is worrisome given the amounts of capital invested in the industry. From the investors’ point of view it is imperative to ensure that invested capital is put to the best possible use, and a good system of corporate governance is part of the solution. This paper, therefore, attempts to identify the elements that make up good corporate governance of biopharmaceutical firms through a series of case studies on a selection of Danish public companies (GEN, TOPO, ZEAL, BAVA, NEUR).

Mechanisms from classic theory on corporate governance (executive compensation, the board of directors, and monitoring) and theory on governance of innovation are used as a vantage point for the analysis of the empirical findings from the sampled firms. This facilitates the mapping of each firm’s system of corporate governance and a subsequent cross-case comparison and analysis. Through this, patterns in the findings from the individual case studies are identified. Based on this, it is suggested that more successful biopharmaceutical firms’ systems of corporate governance are a mixture of mechanisms from both classic theory and theory on governance of innovation. In line with theory on governance of innovation, the findings imply that more successful firms employ governance mechanisms that empower the cumulative collective learning process that is innovation. Specific elements that are central to achieving this are alliances, the delegation of control to individuals that are insiders to the process that generates innovation, and long-term commitment of resources (financial, human, and physical). The findings also imply that elements to a good system of corporate governance include traditional mechanisms such as incentive alignment and monitoring of the executive board.

That is, the mechanisms from theory on governance of innovation and traditional mechanisms of corporate governance are argued to complement each other in a way that enhances the investors’ chances of receiving a return on investment. Consequently, it is inferred that a good system of corporate governance of biopharmaceutical firms includes elements from both schools of theory.

Ultimately, the findings lead to four preliminary recommendations of mechanisms that, together and separately, supplement the traditional mechanisms in forming a good system of corporate governance. A potential path going forward for these recommendations to become actionable mechanisms is suggested through the formulation of topics of further research that serve to verify and elaborate on the preliminary recommendations.
# Contents

Chapter 1 – Introduction ........................................................................................................ 3
  1.1 – Structure of the Thesis .............................................................................................. 4

Chapter 2 – The Role of Corporate Governance .............................................................. 5
  2.1 – Theoretical foundation .............................................................................................. 6
    2.1.1 – The Mechanisms of Corporate Governance ......................................................... 6
    2.1.2 – Governance of Innovation .................................................................................. 9

Chapter 3 – Biotechnology and Pharmaceuticals ............................................................ 13

Chapter 4 – The Study .......................................................................................................... 18
  4.1 – Research Question .................................................................................................... 19
  4.2 – Delimitation ............................................................................................................... 19
  4.3 – Methodology ............................................................................................................ 20
    4.3.1 – Deductive and Inductive approaches .................................................................... 20
    4.3.2 – Limitations of Qualitative Research .................................................................... 21
    4.3.3 – Validity and Generalizing ................................................................................... 22
    4.3.4 – Sample ............................................................................................................... 24
    4.3.5 – Data Collection ................................................................................................... 26

Chapter 5 – Case Studies .................................................................................................... 28
  5.1 – Case 1: Genmab ........................................................................................................ 28
  5.2 – Case 2: Topotarget .................................................................................................... 37
  5.3 – Case 3: Zealand Pharma .......................................................................................... 43
  5.4 – Case 4: Bavarian Nordic ......................................................................................... 51
  5.5 – Case 5: NeuroSearch ............................................................................................... 57

Chapter 6 – Cross-Case Comparison .................................................................................. 65
  6.1 – Answer to Sub-Question 1 ........................................................................................ 66
    6.1.1 – Board of Directors ............................................................................................. 66
    6.1.2 – Ownership Structure ......................................................................................... 67
    6.1.3 – Executive Compensation .................................................................................... 68
  6.2 – Answer to Sub-Question 2 ........................................................................................ 68
6.3 – Answer to Sub-Question 3 ........................................................................................................ 70
6.3.1 – Collective Learning .............................................................................................................. 72
6.3.2 – Alliances ............................................................................................................................ 73
6.3.3 – Large Investors .................................................................................................................. 75
6.3.4 – Board of Directors ........................................................................................................... 76
6.3.5 – Executive Board ................................................................................................................ 76
6.3.6 – Implications for Corporate Governance ........................................................................... 77
6.4 – Answer to Sub-Question 4 .................................................................................................... 79
6.4.1 – Preliminary Recommendations ......................................................................................... 79
6.4.2 – Further Research ............................................................................................................. 80

Chapter 7 – Conclusion .................................................................................................................. 82

Bibliography ..................................................................................................................................... 84

Appendix A – Schematic Cross-Case Comparison ........................................................................ 89
  Exhibit 1 – Alliances .................................................................................................................... 89
  Exhibit 2 – Composition of the Board of Directors ................................................................. 89
  Exhibit 3 – Composition of the Executive Board ................................................................... 90
  Exhibit 4 – Executive Compensation ....................................................................................... 90
  Exhibit 5 – Ownership Structure ............................................................................................. 91
  Exhibit 6 – Product Portfolio ................................................................................................... 91
  Exhibit 7 – Risk Management .................................................................................................. 92
Chapter 1 – Introduction

Biopharmaceutical firms engage in research and development that holds enormous strategic potential due to patent protection and the resulting monopoly pricing power. As a result, the industry has grown to become huge with an overall market value of more than USD 2.5 trillion and some 1800 listed companies. However, the little existing research on the subject indicates that the industry as a whole is highly unprofitable (Lazonick & Tulum, 2011), which is worrisome given the amounts of capital invested in the industry. From the investors’ point of view it becomes imperative to ensure that invested capital is put to the best possible use in terms of economic value added. A good corporate governance system – as a set of mechanisms through which the investor can ensure that the firms they have invested in are managed in the best possible way – is part of the solution. However, the nature of innovation and biotechnology in particular creates significant levels of information asymmetry, which raises the requirements for such a system to be successful. The current knowledge of the governance structures in place in the biopharmaceutical industry is limited, although one of the few existing studies does indicate that the standard agency theory is virtually useless (Duncan et al, 2006). As a possible response to this problem, theories on governance of innovation have emerged with a more holistic concept of corporate governance (Lacetera, 2001; Makri et al, 2006; O’Sullivan, 2000). The most noticeable addition of this new concept is that it goes beyond the relationship between shareholders and managers by including the underlying process of innovation as a central part of a firm’s governance.

The above circumstances lead to the overall research question of this thesis:

What are the elements that make up a good system of corporate governance of biopharmaceutical firms?
1.1 – Structure of the Thesis

- Introduction to the role of corporate governance in corporations. This is followed by a description of mechanisms inspired by principal-agent theory and those offered by theories on governance of innovation (Chapter 2).

- Introduction to the biopharmaceutical industry, which prepares the reader to comprehend the technical aspects of the industry under study (Chapter 3).

- Overview of the study, including a more detailed elaboration of the research question, the study’s delimitation, and the methodological approach and its limitations (Chapter 4).

- Case studies that in part will map the employed mechanisms as well as provide data that may yield valuable information once analyzed in the context of corporate governance (Chapter 5).

- Cross-case comparison and discussion leading to the formulation of initial recommendations and topics of further research (Chapter 6).

- Conclusion (Chapter 7)
Chapter 2 – The Role of Corporate Governance

The paper takes a vantage point in the traditional principal-agent theory of corporate governance, rooted in Jensen and Meckling’s (1976) separation of ownership and control and based on a contractual view of the firm. In this setting the primary concern is to ensure the protection of shareholders’ interests by allocating decision rights with respect to who makes investment decisions in corporations, what type of investments they make, and how returns are distributed.

The theory of the firm as a nexus of contracts can be traced back to Coase (1937) who argues that an organization arises as a means to lower transaction costs by internalizing tasks that otherwise would be fulfilled via market transactions. Jensen and Meckling (1976) add to this contractual notion of the firm by viewing it as a legal fiction rather than an individual. They emphasize (property) rights as being central to the allocation of costs and rewards within the organization - rights that generally are specified through explicit and implicit contracting, which in turn affects the behaviour of individuals within the organization. The necessity of having sound governance practices in place can be understood by acknowledging that any such contract is an agency relationship under which the principal(s) engages an agent to carry out a service on his or her behalf. Consequently, the principal must, to a varying degree, delegate authority over the decision-making process to the agent. Jensen and Meckling (1976) argue that, if both parties are maximizing their own utility, there is good reason to expect that the agent will not always work in the best interest of the principal. The agent’s ability to maximize own utility despite the fact that such behaviour may be damaging to the principal rests in an inability to (efficiently) form complete contracts that cover all possible contingencies. Furthermore, in the corporate setting, the principals (i.e. shareholders) are for the most part not qualified nor informed enough to ex ante distinguish value destroying from value enhancing behaviour. In their survey Shleifer and Vishny (1997) provide examples of agency problems; exerting insufficient effort, expropriation, pursuing pet projects, enjoying private benefits, empire building, entrenchment, and excessive risk-taking. Some of these are limited to managers’ behaviour and decisions while others are applicable throughout the organizational chain of command.

In conclusion corporate governance can be defined as the whole set of mechanisms that serve to mitigate the agency costs in the corporations. These agency costs derive from the fact that the contracts between those investing money in corporations (principals) and those managing these corporations
(agents) are incomplete. This leaves room for post-contractual opportunism by the agents, which in turn may lead to reduced firm value.

2.1 – Theoretical foundation

This part is divided into two subsections that respectively focus on the theory and research on traditional corporate governance mechanisms and the emerging body of literature on governance of innovation.

2.1.1 – The Mechanisms of Corporate Governance

This subsection provides an overview of the mechanisms of the principal-agent framework that traditionally have been relied upon to ensure the flow of external financing from investors and creditors. The main purpose of the various corporate governance mechanisms is to create the appropriate incentives to managers and align their behaviour with the maximization of firm value. Apart from the mechanisms that are the main focus of this study (see below), it is of course acknowledged that many other control mechanisms contribute to mitigating the agency problems (e.g. competition, government regulations, internal auditing, and legal environment). However, in terms of the scope of this thesis it has been decided to focus on the few main control mechanisms, i.e. remuneration, monitoring, and the board of directors. These mechanisms have all been widely referred to in the literature on corporate governance. Moreover, the design of these mechanisms is, within the limits of the legal rules and recommendations, in the domain of the corporations and their shareholders.

Remuneration

The basic component of individuals’ compensation in the corporate setting is the annual base salary, which is present at all levels of the organization. However, as one moves up the organizational ladder individual agent’s actions are more likely to be directly linked to the value and performance of the company. For that reason, it becomes increasingly important to form an incentive contract that aligns the agent’s interests with those of the investors. Put differently, if you want your agent to maximize the value of your investment, you should make him/her share part of the returns. Typically, this is achieved by introducing short and long-term components in the top management pay that are contingent on a
measure of performance that is highly correlated with the value created by the managers of the firm. That is, outcome-based incentives such as annual cash bonuses upon meeting KPI targets, and equity-based programs that on an annual basis award participants actual shares or the option to buy a share at a given price in the future.

While tying managers’ compensation to a measure of firm performance or shareholders’ wealth can motivate the manager to act in the interest of the shareholder and, therefore, reduce agency problems, it does not come without costs. Equity holdings create a one-to-one relationship between changes in a manager’s and shareholders’ wealth. However, a potential cost of this payoff structure is that the manager will make efforts to reduce risk, or even reject risky but positive NPV projects. Share options, on the other hand, add convexity to the compensation package by allowing the agent to face only the upside potential of the company’s combined investments. This decreases the managers’ risk aversion in relation to investment decisions and actions, which can be desirable in firms facing many but risky growth opportunities (Core et al, 2003). The danger of using share options is that the contract becomes too convex, which can induce the manager to take gambles with the investors’ money.

**Monitoring**

This mechanism rests on the assumption that investors can raise net present value by engaging in monitoring of the managers’ actions. Tirole (2001) distinguishes between active and passive monitoring by defining the former as an attempt to affect value (prospective), whereas the latter type is concerned with the measurement of value (retrospective). The common denominator for the two types of monitoring is that they both provide a disciplining effect on the managers’ behaviour. The concentration of ownership, i.e. the size of the ownership share held by the largest or few largest investors in the firm, is generally assumed to be a good proxy for the propensity to monitor. This is because the financier’s ability to exert control and realize gains as well as sensitivity to performance increases as his or her stake in the company increases. For instance, Holderness (2003) finds that the presence of blockholding shareholders significantly reduces the size of executive compensation, which is interpreted as evidence of a substitution effect of monitoring for pecuniary incentives. A similar reasoning applies to the presence of a large debtholder due to the combination of financial incentives and control provided by debt covenants. The key element in both scenarios is that the monitoring entity
is a credible threat to management in terms of ability and incentive to intervene.

**Board of Directors**

The board of directors represents an important mechanism of corporate governance, constituted for the purpose of monitoring firm management on behalf of the shareholders. By law, the board of directors has the power to choose, compensate, and replace top management, and is thus in charge of safeguarding the investors' interests. The board is (except for some countries where part of the board is elected by employees) elected by shareholders and assembles on a regular basis. In literature, three main roles have been associated with the board of directors; the monitoring role, the advisory role and the resource-provision role of the board.

The main contribution comes in the form of internal governance and the disciplining effect that monitoring provides. Hermalin and Weisbach (2003) argue that this effect is increasing with board independence based on the finding that boards become more likely to replace a CEO following bad performance when the proportion of independent directors increases. Linck et al (2008) concur to this point of view but they also find that firms with many growth opportunities, high R&D expenditures, and high share return volatility have smaller and less independent boards. The traditional interpretation is that the cost of transferring information to outsiders under high levels of information asymmetry outweighs the corresponding gain from improved monitoring. In addition, as the information asymmetry increases it becomes increasingly costly to transfer inside information to external experts serving on the board as a source of advisory and resource-provision.

The advisory and resource-provision role is the board’s second most important contribution to ensuring that shareholders get a return on their investment. It can be broadly defined as individuals that have the ability to bring anything that can strengthen the position of a given firm. Specifically, it includes aspects such as bolstering the public image, providing expertise and advice, linking the firm to important stakeholders, and aiding in the formulation of strategies or other important decisions (Hillman et al, 2008).

---

1 Hermalin and Weisbach find no correlation between firm performance and board composition, however, they argue that this is explained by the propensity to add independent directors following bad performance.
Most of the corporate governance literature presented thus far analyzes how the specific design of the corporate governance mechanisms stated above (i.e. incentive schemes, board structure, and division of ownership) affects their efficiency in solving the agency problems between managers and shareholders. In doing this, scholars mostly consider these problems in the perspective of large, mature, publicly listed corporations. The same reasoning may, however, not apply to all types of corporations, such as for example highly innovative firms that “never really mature” and largely depend on employees making firm-specific investments, i.e. human capital. The following subsection gives an account of the suggested improvements to current corporate governance practices that have emerged in the wakes of the increasing importance of innovation as a factor for success.

2.1.2 – Governance of Innovation

Innovation has become a vital source of competitive advantage to many industries with biopharmaceuticals as an extreme example. The biopharmaceutical industry needs capital to be invested in the long-term development of intellectual property rather than equipment and machinery. Hence, investors and creditors are left with a highly limited base of tangible asset that can act as collateral in case the firm performs poorly. This and the high degree of information asymmetry associated with technologically complex projects underlines the necessity of well-designed corporate governance structures to ensure alignment of interests. The specifics of the biopharmaceutical industry also suggest that the standard mechanisms of governance may act differently in these firms. For example, in relation to remuneration of managers Makri et al (2006) posit that – although the majority of scholars agree that executives must be rewarded in a manner that incentivizes long-term value creation – an optimal measure of value enhancing behaviour is yet to be identified for innovative companies. Proponents of outcome-based incentives argue that a high degree of information asymmetry necessitates tight coupling of executive pay and financial performance. That is, due to the increased difficulty and cost of monitoring decisions ex ante. The critics of equity-based remuneration dispute its usefulness because agents (managers) do not enjoy the principal’s (investor) freedom to diversify via asset allocation. Consequently, risk-averse agents are expected to counter the increased risk-bearing by targeting low-risk investments, which in turn may lead to sub-optimized returns for the
principal. Instead, it is proposed that the principal invests in acquiring the necessary information to judge an agent’s actions. This allows for the provision of incentives that reward behaviour that is positively correlated with the probability of successful innovation, e.g. innovative skill, quality of research etc. The downside of behaviour-based incentives is that decisions to reward or punish become largely, if not entirely, subjective and dependent on the principal’s ability to form adequate information from complex data. In combination, this may increase the agent’s perception of risk-bearing to an even greater extent than objective-based incentives. It is based on this that Makri et al (2006) ask for new methods of incentivizing employees in innovation-driven firms.

O’Sullivan (2000) more generally contests the principal-agent theory by arguing that it is rooted in the neoclassical view upon value creation as occurring through mutually beneficial exchanges (i.e. resource allocations) that are assumed to be optimal, individual and reversible. Optimality assumes that decisions on resource allocation are shaped and constrained by prevailing technological and market conditions that are externally given, i.e. outside the influence of the individual actors. Decisions are also deemed to be individual in the sense that an actor allocates resources on the basis of individual preferences, irrespective of the decisions and actions of other actors. Finally, any exchange is assumed to be reversible because today’s returns and allocation of resources are independent of any such returns and decisions in the future. In contrast to this both O’Sullivan (2000) and Lacetera (2001) agree that innovation is a complex evolutionary process that involves collective learning among internal and external stakeholders. Collective learning is defined as an organizational process that occurs as a result of the interaction of individuals with different objectives and capabilities. Actors must commit to irreversible and uncertain investments in an environment that integrates organizational resources as part of a strategy to transcend the market and technological conditions that, if successful, will lead to some form of competitive advantage.

Lacetera (2001) further argues that traditional principal-agent theory fails to capture central features of business organizations by viewing them primarily as a contractual construction for reducing transaction costs. In his view, the objective too easily becomes one of only designing incentive schemes that realign the management’s interests with shareholders’. In other words, the age of innovation has brought about a new paradigm of value creation that requires a new approach to corporate governance
that digs deeper into the processes and factors that are important to the commercial success of innovative firms.

O’Sullivan (2000) defines the ideal system of corporate governance for innovative firms as one that fosters three conditions – (i) financial commitment, (ii) organizational integration, and (iii) insider control – that together facilitate the commitment of financial, human and physical resources to innovation. *Financial commitment* requires institutions to support businesses with ongoing access to the economic resources necessary to sustain innovative investments long enough for them to generate returns and liquidity. *Organizational integration* induces participants to engage in long-term commitments of their skills and effort, rather than selling it in the open market, as means to achieve the goals of the firm. The final condition of *insider control* suggests that control should be given to those that have the incentive and ability to allocate resources to innovative investments. Preferably these same individuals should be insiders to the process that generates innovation because strategist must be aware of what the learning process is in order to shape it and take advantage of opportunities. O’Sullivan (2000) further posits that the integration of strategic decision-makers with the organizational learning process can act as an incentive mechanism because firm-wide success is directly linked with personal success. The three conditions’ implication for corporate governance is that attention shifts from incentivizing and monitoring managers alone to include a wider organizational agenda of ensuring the commitment from stakeholders that provide financial, physical, and human resources.

O’Sullivan (2000) suggests that the prospect of receiving a share of the gains from innovation as an important motivator for employees to commit to relation-specific investments. Lacetera (2001) identifies alliances as a potentially important stakeholder to consider – although their impact on corporate governance is unspecified – as they can be a source of financial, physical, and human resources. Lacetera (2001) also suggests that priority should be given to insiders, or individuals who are continuously involved with the enterprise when electing board members. That is, the board of directors is central to strategic decisions, and therefore its members should possess in-depth knowledge of the firm’s activities in order to make resource allocation decisions that promote the utilization and enhancement of innovative capabilities. In this setting the board’s role resembles Hillman et al’s (2008) definition in that the board becomes more than just a monitoring entity on behalf of the shareholders.
Lacetera (2001) does, however, also suggest that insiders will provide better monitoring because they are better informed about a firm’s operations. Lastly, Lacetera (2001) proposes that the act of granting authority and decision-making power to employees that also are insiders to the learning process can benefit innovation because it is powerful catalyst for the sharing of knowledge and capabilities, i.e. collective learning.

From the perspective of the ownership structure, certain types of owners may be more beneficial for innovative companies, i.e. owners that have a more long-term investment horizon, such as industrial foundations, pension funds etc. Moreover, financial commitment is expected to be positively correlated with ownership concentration because large investors’ tend to commit to longer holding periods (Lacetera, 2001).

The theme of governance of innovation is that the main concern should not be the separation of ownership and control. Instead, the focal point should be the organizational structures and relations that facilitate and empower the flow of knowledge and integration of different capabilities.

Despite the emphasis on a wider definition of corporate governance, Makri et al (2006) and Lacetera (2001) both accept that the traditional principal-agent perspective does have its merits. That is, the central variables (i.e. board composition, financial performance, remuneration etc.) are relatively easy to observe and control, and hence also straightforward to apply to corporations. Moreover, it is imperative to realize the need for appropriate economic incentives and monitoring to deter opportunistic behaviour of those in a position to affect shareholder value. Therefore, effort should be channelled into identifying new ways to accomplish this while promoting the prospects of innovation. But this alone will not ensure successful innovation. Therefore, apart from ensuring a disciplining mechanism towards managers, the system of corporate governance should be designed in a way that also ensures the commitment of financial, human, and physical resources to innovation.

The following section will describe the setting of the study by providing an introduction to central characteristics of the biopharmaceutical industry, and explain why this particular industry is an interesting subject of study. This will enable us to proceed with a more detailed elaboration of the study (chapter 4).
Chapter 3 – Biotechnology and Pharmaceuticals

The Oxford Dictionary defines biotechnology as “the exploitation of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc”. The focus of this thesis is a sub-segment of the biotech industry labelled as biopharmaceuticals, which is concerned with the development and commercialization of pharmaceuticals produced from biological or cellular components. Biopharmaceuticals have grown to become a huge industry with an overall market value of more than $2.5 trillion and some 1800 listed companies, and given breakthroughs in genetics the industry does have enormous strategic significance and potential for the betterment of humankind. Unfortunately, the biopharmaceutical industry is also characterized as a high risk environment with an aggregate net income for publicly held companies hovering around zero. In fact, if the most profitable firm, Amgen, is excluded then the industry has consistently been unprofitable (Pisano, 2006).

The typical firm starts as a research project led by scientists who then form partnerships with professional managers. Therefore, most firms do not have a marketable product for years following their inception. This is apparent from the distribution of P/E ratios in figure 1 for publicly listed biopharmaceutical companies in the US. It shows that the majority of firms in the industry create no economic value in terms of earnings to investors.

Figure 1: Distribution of P/E Ratios, Publicly Listed (US) Biopharmaceutical Firms (source: yahoo.finance.com)
Consequently, the progress of research and development is dependent on the presence of external capital and patient investors. That is to say, the biopharmaceutical industry’s growth and survival relies on institutions’ willingness to provide financial commitment.

Figure 2 illustrates the development process for a successful biopharmaceutical drug, which according to info provided by the California Biomedical Research Association (CBRA) takes, on average, 12 years to complete.

**Figure 2: The Biopharmaceutical R&D Process**

![Diagram of the biopharmaceutical R&D process]

*Discovery and Pre-Clinical Phase*

The first part takes place in the lab where scientists determine what genes, bacteria, or viruses cause a given disease. Once this has been identified the research continues to a stage that involves breaking up the different components that make up a disease in order to identify the abnormalities that are taking place. Based on the findings, scientists then attempt to develop a drug that holds the potential to treat abnormalities. In the pre-clinical phase scientists determine the efficacy and safety of the most promising compounds by conducting tests with living biological systems. CBRA provides data that suggests that only 10 percent of drugs that enter pre-clinical testing progress to the clinical trials and that entire process from discovery to completion of the pre-clinical phase on average takes 3 years.

*Clinical Trials*

In phase I clinical trials the new drug is tested in smaller samples of 20 to 80 healthy subjects in order to study activity as well as potential toxicity in humans. If successful, the drug moves on to phase II where the drug is tested in 100-300 subjects with the disease, during which efficacy and optimal dosage is determined. In Phase III the drug is tested in larger samples of subjects in clinics and hospitals so that physicians can closely monitor the effects of the drug and determine possible side-effects. DiMasi et al
estimate that the length of trials averages 1.6 years, 2.5 years, and 2.7 years for Phase I, II, and III respectively.

Approval

Upon successful completion of the clinical trials the developing firm must provide all relevant data proving the efficacy, side-effects, and overall safety of the drug. When approved the drug is made available to physicians for prescription. An estimated 30.25 percent of drugs entering clinical trials in the US ultimately receive the approval for marketing (DiMasi et al, 2007). Figure 3 illustrates the probabilities of transition for each of the three phases.

DiMasi et al (2007) find that the average cash outlay incurred per approved biotechnology drug totals USD 559m. Furthermore, the time from discovery to final approval and commercialization of a product is lengthy, and consequently also costly. The Di Masi study shows that the average capitalized cost of development per approved drug rises to USD 1.2bn when including the time-value of money.

Thus far, we have intentionally emphasized the risk of the biopharmaceutical industry as it makes explicit the high costs of conducting research. For instance, approximately 40 percent of the development cost is incurred already before the drug goes into clinical trials while only 30 percent of

---

2 DiMasi et al arrive at this number by multiplying the cash outlays for each step with a reverse discount factor.
drugs entering clinical trials ever make it through to approval. However, there is of course a significant reward for investing in biopharma; patent protection provides a long-term barrier to entry for successful drugs, which facilitates monopolistic advantages that lead to sizeable and sustainable earnings over the duration of the patent. As a result, biopharmaceutical firms offer potentially high returns to investors, particularly those willing to take the risks in the early stages of R&D. This is supported by the fact that firms that do have successfully commercialized drugs\(^3\) generally exhibit very high price-earnings ratios (figure 1), and consequently also high payoffs to early investors such as venture capitalists.

As pointed out, the commercial uncertainty is huge with only a minute share of the drugs under development becoming commercially viable. This is the biggest obstacle to investors because it makes it next to impossible to tell in advance which drugs will make it. Part of the problem is that the high technical complexity of the biopharmaceutical industry leads to a high degree of informational asymmetry. This makes it difficult for investors or directors to tell when an investment is justified and when it is not, and ultimately whether a manager is competent or not. It presents serious challenges to corporate governance of biopharmaceutical firms, since the risk is that shareholders’ funds are invested in projects with negative net present value rather than paid out to shareholders as dividends. In the case of companies with marketed products, Jensen (1986) states that the manager always has an incentive to retain cash even when there are no projects yielding a positive NPV. This is based on the assumption that paying out dividends today increases the probability of the manager having to acquire external financing in the future, which will make him or her subject to increased monitoring. In fact, Jensen argues that agency problems are bound to be more severe in companies with high free cash flows but few or no projects available that yield positive economic rents.

In conclusion, the challenges to biopharmaceutical firms are that the high uncertainty underlying the development process means that many factors other than the managers’ effort come in to play in terms of firm performance. Consequently, it is necessary to come up with other measures that can incentivize and reward managers’ for their contribution. It is also of great importance to acknowledge that biopharmaceutical firms are highly dependent on human capital in order to succeed, which implies a need for measures that incentivize employees to commit. In addition, the lengthy development process

\(^3\) Firms with positive P/E ratios are by the researcher assumed to have marketed products.
necessitates patient investors that are willing make long-term commitments of resources. Finally, the high degree of information asymmetry means that investors often are unable to comprehend the technicalities of the biopharmaceutical industry. Therefore, managers are given more discretion, which unfortunately also increases the room for post-contractual opportunism. This increases the requirements to a system of mechanisms that facilitate efficient monitoring of the executive board’s decisions.

The above calls attention to the need to investigate and identify weaknesses, strengths, and amendments to current corporate governance practices in the biopharmaceutical industry.
Chapter 4 – The Study

This study will attempt to uncover characteristics that can be identified as benefitting the corporate governance of biopharmaceutical firms by taking a vantage point in a selection of business cases from the Danish biopharmaceutical industry.

This will be achieved by mapping, analyzing, and discussing the employed governance mechanisms and structures by making comparisons to both principal-agent theory and theories on governance of innovation on a single-case as well as cross-case level. In brief, the distinction between the two comes down to the former’s focus on disciplining and incentivizing management, whereas the latter provides a more integrative solution that takes other stakeholders beyond the shareholders as well as organizational processes into consideration. The specifics of each school of theory have been presented and discussed in chapter 2.

The purpose of the study is not to categorize either approach as being good or bad but rather to arrive at meaningful preliminary recommendations and topics of further research. The outcome will quite likely be a combination of the chosen literature on governance, although the study of course will be open to any possible solution discovered during the case-work. Ultimately, the aim is to relate these findings to governance solutions and to build on these solutions to create proposals on the specifics that should be considered in a governance system of biopharmaceutical firms.

The Danish biopharmaceutical industry has been chosen as population for the selection of cases. This is partly due to the ease at which data can be collected but also because Denmark is among the world leaders in terms of research and development within biopharma. In a report from 2011 published by Dansk Biotek, Denmark is ranked second worldwide on R&D investments in biopharma as a share of total GDP, number of citations for research, and number of publicized patent applications per citizen. Denmark is also part of what commonly is referred to as Medicon Valley, which is one of Europe’s strongest life-science clusters. It is by many considered is to be the cradle of biotech\(^4\).

\(^4\) www.MediconValley.com
4.1 – Research Question

In order to answer the overall research question

*What are the elements that make up a good system of corporate governance of biopharmaceutical firms?*

The following sub-questions have been formulated

1. How do biopharmaceutical firms’ corporate governance structures resemble principal-agent theory?

2. How do biopharmaceutical firms’ corporate governance structures resemble theory on governance of innovation?

3. What are the implications of the findings from questions (1) and (2) to the overall picture of biopharmaceutical firms’ corporate governance?

4. What are the preliminary recommendations and/or topics of further research based on the findings in question (3)?

4.2 – Delimitation

This thesis is intended to provide recommendations on good corporate governance in the biopharmaceutical industry through the application of qualitative analysis on five business cases. This is an active choice to facilitate a cross-case synthesis that will increase the extent to which the findings can be generalized (Yin, 2009). However, due to limitations in time, space, and the case companies’ willingness to share sensitive information, the study will be made solely on the basis of documentation and archival records. The consequences of this choice will be discussed in section 4.3.3. Finally, it is not the intention to cover good corporate governance of innovative firms in general – only biopharma.
4.3 – Methodology
The formulated research question is open ended and its overall goal is to uncover a phenomenon on which there exists a limited body of theory and research. In this setting, Ghauri et al (1995) propose the use of a qualitative research method. In addition, it is the intention to develop pertinent hypotheses (i.e. preliminary recommendations) and propositions for further inquiry, which favours conducting exploratory case studies (Yin, 2009).

4.3.1 – Deductive and Inductive approaches
The exploratory nature of the study implies the use of an inductive, bottom-up approach (figure 4). Here the empirical observations are taken as a point of departure for a cross-case analysis that leads to the identification of patterns that form the basis for the formulation of tentative hypotheses. However, the researcher will also make use of existing theory (Chapter 2) in order to support the analyses that lead to the detection of these trends. Saunders et al (2000) in fact suggests that the use of a theoretical foundation can be a helpful analytical tool when conducting inductive research. Therefore, the study also to some extent employs a deductive approach that has theory as the starting point for the formulation of hypotheses (figure 5).

Source: Flick (2006)
The main point of difference between the approaches is that deductive research aims at confirming or rejecting hypotheses based on existing theory, whereas inductive research aims at adding to, or creating new, theory (Flick, 2006). Consequently, this study will assume a deductive approach in the initial phase of gaining an understanding of the issue at hand and in the analysis of the findings. The inductive approach will, however, be employed in arriving at a conclusion concerning recommendations of elements in a good system of corporate governance of biopharmaceutical firms.

To sum up, the study design involves a series of case studies that focus on the collection of qualitative data relevant to overall research questions. This is then analyzed through a juxtaposition of inductive and deductive method, which leads to the formulation of preliminary recommendations and topics of further research.

4.3.2 – Limitations of Qualitative Research

Qualitative research method is ideal for conducting studies that intend to examine a limited number of cases in depth, which is useful when attempting to describe complex phenomena that are not easily defined or explained (Flick 2006). However, it is also a method of research that is full of pitfalls if not conducted properly, and therefore a few caveats on the limitations of qualitative research are in place.

First of all, qualitative research typically focuses on small samples, which makes it difficult to generalize findings to larger populations. In relation to this, the fact that the outcome of qualitative research is dependent on the judgment and interpretation of the researcher(s) leads to issues with regards to the validity of the findings. That it is, the centrality of the researcher’s role can potentially lead to biases that impede the ability to generalize and draw conclusions. The researcher’s subjectivity also gives rise to potential issues of reliability because the extent to which other researchers will arrive at the same conclusions is questionable due to divergence in individuals’ interpretations (Yin, 2009).

The next section will explain how the above limitations of qualitative research affect this study.
4.3.3 – Validity and Generalizing

Yin (2009) summarizes three areas of validity that are relevant when conducting exploratory case studies. Together they determine the validity and ability to generalize findings to larger populations.

- Construct Validity: identify correct operational measures for the concepts under study
- External Validity: Define the domain to which the study’s finding can be generalized
- Reliability: Ensure that the operations of the study can be repeated with the same outcome

**Construct Validity**

In terms of construct validity, the intention is to uncover mechanisms that are associated with good corporate governance. Two objective measures have been identified (cf. Section 4.3.5); long-term share performance and the depth and width of the case company’s product portfolio. The former measure has been criticised for being an inappropriate measure of performance due to the lengthy development process (cf. Chapter 2). However, it is argued that the quality of management is bound to be reflected in the share price over a longer period, i.e. 10 years. The extent to which a company can progress and commercialize drug candidates is similarly expected to be a good proxy for the cumulative effort and impact of the management and governance structures over time. Finally, good corporate governance will also be measured through the identification of mechanisms that based on theory can be interpreted as having a mitigating effect on agency problems.

The biggest drawback of this study with respect to construct validity is that the researcher only makes use of two very similar sources, i.e. Documentation (news articles, company websites etc.) and Archival Records (financial reports, incentive schemes etc). This does not necessarily imply poor construct validity but it does eliminate the benefit of using several different sources, e.g. structured interviews and documentation. This, in turn, makes void the possibility of triangulating the findings as a means to reduce potential biases and increase overall validity. Specifically, triangulation is intended to provide the researcher with different views on the same problem, which leads to a thicker analysis (Yin, 2009).
External Validity and Reliability

External validity and reliability are concerned with the extent to which findings can be generalized based on how representative and replicable the study is. Yin (2009) suggests using theory to support the analysis and developing a case study protocol that allows other researchers to replicate the study in order to enhance external validity and reliability, respectively. This study does make use of an extensive theoretical body (Chapter 2) and the sampling and data collection procedures have been formalized in sections 4.3.4 and 4.3.5.

In terms of generalization and external validity, Eisenhardt (1989) suggests a range of 4 to 10 cases as appropriate for a cross-case analysis intended for theory development. Due to time constraints and limits to the size of the thesis it is only possible to study 5 cases, which nevertheless is a sample size that satisfies Eisenhardt’s requirement.

Population and Sampling

The choice of population and the consequent sample is another important factor for the ability to generalize findings. The choice of the Danish Biopharmaceutical industry as population can on one hand be argued to be valuable to this study because Denmark is a leading nation within biotech. Hence, Danish firms may be more likely to exhibit governance mechanisms and structures suitable for innovation, which would support the study’s purpose of reporting on good corporate governance.

On the other hand, it is also possible that other country-specific factors, that are unrelated to corporate governance, influence innovative capability (a good education system, abundance of talent, a history as life-science pioneers etc.). Other governance-related factors include the legal and regulatory environment in terms of investor protection, e.g. requirements to disclosure. The presence of these factors will of course entail a bias in the findings of the study, which in turn will hamper validity and limit the extent to which the findings can be generalized.

Given that human capital is highly mobile in today’s global environment, it is argued that the location-specific abundance of talent and quality of education system have a limited impact. Moreover, despite the fact that Denmark by some is regarded as the cradle of biotech, it is unquestionable that innovative
activity will be determined by the presence of capital rather than legacy – especially because today’s capital markets are largely global as well.

With regards to the legal environment, it makes sense to limit the extent to which the findings can be generalized to countries that have similar legal and regulatory environments, since this is shown to have a significant effect on corporate governance (La Porta et al, 2000). In terms of the sampled firms’ representativeness of the general biopharmaceutical industry then there is found no reason to believe that Danish firms’ innovative process will be different from others’. That is, the industry requirements are largely standardize since all companies must pass the same process to receive approval, e.g. through the FDA in the US and the EMA in Europe.

*Overall Validity and ability to Generalize*

In conclusion, in designing the study emphasis has been given to improving construct and external validity as well as reliability in order to limit bias and increase the extent to which findings can be generalized. The biggest drawback is that there is limited variation in the type of data sources, which eliminates the possibility of triangulation findings and further increasing the validity of the study. The choice of population and sample implies that the findings from the study will be most relevant to biopharmaceutical firms in countries that have a legal and regulatory structure similar to Denmark with regards to investor protection.

### 4.3.4 – Sample

The population of interest is biopharmaceutical§ firms that are headquartered in Denmark and publicly listed on the NASDAQ OMX Copenhagen index. The latter requirement is a matter of increasing accessibility to information on case subjects provided by the requirements for disclosure of listed companies.

The members of the population have been identified by retrieving the names of companies listed under the health care sector of NASDAQ OMX CPH. These have then have been matched with a list of all

---

§ *Biopharmaceutical* refers to the definition put forward in Chapter 3.
Danish Biotech firms in terms of their activity. This is done in order to ensure that the selected companies indeed identify as biopharmas. Using this method a total of 12 firms was identified.

<table>
<thead>
<tr>
<th>Name</th>
<th>Activity</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affitech</td>
<td>R&amp;D</td>
<td>Cancer, Inflammatory Diseases</td>
</tr>
<tr>
<td>ALK-Abello</td>
<td>R&amp;D, Production</td>
<td>Allergens</td>
</tr>
<tr>
<td>Bavarian Nordic</td>
<td>R&amp;D, Production</td>
<td>Infectious Diseases</td>
</tr>
<tr>
<td>Exiqon</td>
<td>R&amp;D, Production</td>
<td>Genetic Diagnostics</td>
</tr>
<tr>
<td>Genmab</td>
<td>R&amp;D</td>
<td>Cancer, Infectious Diseases, Inflammatory Diseases</td>
</tr>
<tr>
<td>H. Lundbeck</td>
<td>R&amp;D, Production</td>
<td>Central Nervous System Diseases / Disorders</td>
</tr>
<tr>
<td>NeuroSearch</td>
<td>R&amp;D</td>
<td>Cancer, Central Nervous System Diseases / Disorders</td>
</tr>
<tr>
<td>Novo Nordisk</td>
<td>R&amp;D, Production</td>
<td>Diabetes, Hormones</td>
</tr>
<tr>
<td>Novozymes</td>
<td>R&amp;D, Production</td>
<td>Enzymes</td>
</tr>
<tr>
<td>Topotarget</td>
<td>R&amp;D</td>
<td>Cancer</td>
</tr>
<tr>
<td>Veloxis Pharmaceuticals</td>
<td>R&amp;D</td>
<td>Organ Transplants</td>
</tr>
<tr>
<td>Zealand Pharma</td>
<td>R&amp;D</td>
<td>Peptides</td>
</tr>
</tbody>
</table>

Source: www.DanskBiotek.dk

The selection has been carried out by first excluding firms that do not specialize within the development of pharmaceuticals. This distinction has been made because it may be inappropriate to make cross-case conjectures between two types of business models due to potential differences arising from specialization or diversification. Consequently, Novozymes has been excluded because pharmaceuticals only are one of many business units in a portfolio that ranges from drugs to textiles. Affitech has also been excluded based on preliminary research showing that the company is pending to be delisted.

Final selection has been made after having examined the availability of the study’s two key sources of evidence, i.e. documentation (news articles, company websites) and archival records (financial statements, personnel records, incentive schemes etc.) associated with each firm. Priority has been given to firms with the most available data in order to facilitate the application of the analytical framework of the study. In this process ALK-Abello, H. Lundbeck, and Novo Nordisk were excluded due to an overwhelming amount of data, which would require a more rigorous study beyond this thesis’ scope.

---

6 This list is available through Dansk Biotek’s annual statistics
The selected cases are,
- Bavarian Nordic
- Genmab
- Neurosearch
- Topotarget
- Zealand Pharma

4.3.5 – Data Collection
A fixed framework for the collection of data has been developed, which will be applied consistently across each case. In this way we control that the same aspects are being considered during the within-case analyses, which will facilitate a more reliable cross-case analysis. Finally, it also serves to ensure that the investigated aspects in fact contribute to the theory of governance of biopharma. The following aspects are therefore considered in the analysis,

Company description
- Alliances
- Product Portfolio
- Risk Management
- Share Performance 10 years (or since IPO)

Corporate governance parameters
- Composition of Board of Directors
- Composition of Executive Board
- Executive Compensation
- Ownership Structure

Alliances with external entities are by Lacetera (2001) expected to be highly correlated with collective learning and innovative success. Moreover, it is critical to consider the financial impact of alliances.

Information on a firm’s product portfolio will be a useful indicator of how industrious the different case companies are, which serves as a proxy for performance.
The approach to **Risk Management** is expected to reveal what areas the respective case companies consider to be critical in terms of preserving shareholder value.

**Share Performance** will serve as a guiding measure of performance.

**Compositions of the board of directors and executive board, Executive Compensation**, and **Ownership Structure** have been included in order to examine the extent to which innovative corporations employ corporate governance mechanisms inspired by principal-agent theory and theory on governance of innovation.
Chapter 5 – Case Studies
The case studies are central to overall study because they provide the data source for the analysis. In order to enhance the clarity of the findings this chapter examines the cases in isolation from each other while Chapter 6 provides an analysis of the findings on a cross-case level. If nothing else is stated the information is retrieved from the respective companies’ corporate websites.

5.1 – Case 1: Genmab
Founded in 1999, Genmab is a leading international biotechnology firm that specializes in the development of human antibody therapeutics for the treatment of cancer. Genmab only engages in the R&D process and leaves the commercialization to strategic partners. For instance, GlaxoSmithKline is in charge of both marketing and producing the only commercialized product in Genmab’s portfolio. The company’s product portfolio is presented in figure 6.

Figure 6 – Genmab Product Pipeline (source: www.genmab.com)

Genmab speaks of alliances and partnerships as one of the cornerstones in building a successful and profitable biotech firm. Current partners include academic institutions, small biotech firms, other biopharma firms, and blue-chip pharmaceutical companies.

By looking into the way Genmab’s alliances are set up it becomes clear that they primarily are a way for the company to continuously acquire further funding for the development of novel human antibodies. CEO Jan van de Winkel explains the role of alliances by pointing to the fact that big pharmas increasingly rely on innovation to come from specialized biotech firms, whereas the biotech industry needs cash for research and development (Winther, August 30th 2012). The way this works is
that Genmab grants licensing and development rights for promising candidates to big pharmaceutical firms (licensees) in exchange for upfront payments, milestone payments, and royalty streams. The milestone payments are contingent on meeting pre-determined objectives put forward by the licensee, and are thus a performance-based means of funding. The licensee also absorbs all future development costs for the drug underlying the agreement in exchange for Genmab’s continued commitment to the development process. This structure allows the parties to the alliances to leverage their respective core competencies.

Genmab’s current big pharma out-licensing partners count Amgen, GlaxoSmithKline, and Janssen Biotech while other alliances include discovery programmes with Roche and H.Lundbeck. For the latter type of strategic partnerships Genmab has received upfront payment for engaging in the search for human antibody therapeutics for predefined disease targets.

Co-development and licensing agreements are made on the basis of the knowledge and expertise inherent in each of the participating entities at a given point in time. It is therefore assumed that the collaboration will, over time, create value beyond what the participants could have achieved separately. If this was not so it would be suboptimal to form such partnerships in the first place because of the possibility to engage in mutually beneficial exchanges in the market, as prescribed by neoclassical theory – which, in turn, would allow Genmab to enjoy the full upside potential. From this perspective, O’Sullivan’s (2000) definition of innovation as an evolutionary process that requires long-term commitment to irreversible and uncertain investments in a cumulative learning process appears to be quite accurate. Consequently, alliances between entities with complementary resources and incentives appear to be a natural solution to facilitating such commitment because both parties stand to gain more from collaborating than by operating independently. The market’s reactions to the announcements of Genmab’s alliances with GlaxoSmithKline and Janssen Biotech\(^7\) were indeed highly positive; the share price jumped 17 and 16 percent respectively. This is a clear indication that investors in both cases anticipated value enhancing synergies from the alliances.

Out-licensing agreements involve the exchange of cash for future rents much like shareholders expect returns on they invested capital. There is however a significant difference between a licensee and an

\(^7\) Company Announcements on December 19th 2006 (GSK) and August 30th 2012 (Janssen)
equity investors; the licensee faces a sunk cost upon the initial investment whereas the equity investor easily can reverse an investment to cash. An equity investor can also realize gains based on expected future returns via market transactions, and hence their time horizon will not necessarily converge with the development process. This is not the case for a licensee because their returns are contingent on the underlying drug’s successful commercialization, which makes licensing agreements a more suitable source of financial commitment.

Financial commitment is one of the conditions that O’Sullivan (2000) describes as essential to any system of corporate governance in innovative firms. Now, since out-licensing agreements have been shown to be a natural source of such commitment the question becomes how it affects corporate governance. First of all, the licensee (big pharma) has economic incentives, a high level of technical knowledge, and access to insider information that in combination make them a strong candidate for benefiting from monitoring. When there is no exchange of equity the licensee only acquires control rights over the specific drug programme underlying the agreement and the licensee is therefore expected to engage in selective monitoring of that programme alone. However, under some agreements Genmab has also sold large quantities of new shares (up to 10 percent of total equity) to licensees as part of the upfront payment for licensing rights. In this scenario the licensee has economic incentive and control rights that should foster a more general approach to monitoring. The extent to which a licensee will commit resources to such monitoring will depend on the dollar value of the equity investment relative to the licensee’s entire R&D budget. Most big pharmaceutical firms’ R&D budgets amount to several billion USD, and hence the most probable outcome is that licensee will monitor the progress of the licensed drug. This is also based on the fact that the licensee enjoys full control rights and a larger fraction of the payoff from the licensed drug, which facilitates and incentivizes monitoring. In any case, Genmab’s shareholders will benefit from the presence of an out-licensing agreement regardless of which mode of monitoring the licensee may choose.

The allocation of control rights under an out-licensing agreement results in insider control being granted to external agents with the resources and incentives to commit to innovation. This is a modified version of O’Sullivan’s (2000) condition of for the allocation of insider control as her concept of governance assumes that this is a matter, which is internal to the organization. It is, however, not

---

8 Assuming liquid markets
completely new knowledge as Lacetera (2001), based on a review of the pharmaceutical industry, does allude to this possibility.

Organizational Integration and Collective Learning

One of Genmab’s primary concerns in terms of future performance is how to ensure the flow and stability of knowledge within the organization. The company regards the process of sharing knowledge as one method to manage the risks associated with development, technology, and commercialization (Annual Report 2011). Specifically, Genmab attempts to reduce developmental risk by establishing cross-organizational committees of key employees that through combined knowledge, competences, and expertise areas optimizes the selection of disease targets. Technological and commercial risks are managed through alliances and the encouragement of open dialogue with partners with the intent to share new ideas and insights. These are all very specific approaches that serve to facilitate the flow of knowledge and the integration of different capabilities, which as proposed by Lacetera (2001) is central to collective learning.

In order to encourage commitment and organizational integration Genmab offers a competitive compensation package where the most interesting aspect is that all employees participate in a warrant⁹ programme. Co-founder Claus J. Møller explains that it is important to reward talent in order to retain as well as attract new employees (Thorsted 2007). This view is supported by O’Sullivan (2000) who states that allowing employees to realize the gains of their efforts is one of the most powerful motivators for commitment. Furthermore, a study by Anderson et al (2000) shows that executives of firms in the IT industry receive a larger proportion of incentives via options and that IT firms issue more options to employees in general as compared to non-IT firms. Hence, firms in industries that share the biotech industry’s characteristics as being long-term, unpredictable, and innovative are found to employ similar compensation policies. This is an important point to make because it supports the assumption that innovative firms need to provide share-based incentives in order encourage high-quality employees (who are in high demand) to make relation-specific investments.

---

⁹ A warrant is essentially a call option with the only difference being that a warrant is a claim to receive a new share issued directly by the company who granted it
ensuring commitment is underlined by the fact that human capital is mentioned as a separate parameter for risk management by Genmab’s annual reports due to the negative impact of employee turnover on the development process.

Before discussing Genmab’s (and later cases’) choice of directors it is important to present the Danish law on this matter.

The Danish Company Act\textsuperscript{10} prescribes that public companies must employ a two-tiered board structure; an executive board and the choice of either a supervisory board or a board of directors. The supervisory board’s role is solely to monitor the executive board whereas the board of directors also is responsible for strategic management. Consequently, there is a significant difference in the requirements to the level of independence between the supervisory board and board of directors. The former does not allow members of the executive board to sit on the board, whereas executives are allowed to serve on the board of directors as long as they make up less than 50 percent of the board and do not act as chairman or co-chairman of the board.

The concept of independence is important to the quality of governance because directors must be able to make decisions that are uninfluenced by any conflicts of interest. The Committee on Corporate Governance in Denmark\textsuperscript{11} defines an independent director as someone who

- has not recently held a leading position in the company.
- has not received payment from the firm that is not associated with the role as director.
- does not represent a controlling shareholder’s interests.
- has no previous significant relations to the company or related companies, e.g. as supplier, shareholder, customer etc.
- has no family ties with individuals regarded as non-independent.
- has not served as director of the firm for more than 12 years.

Finally, companies with more than 35 employees are required to allow employee-representatives to be elected for the board, if the employees wish to do so.

\textsuperscript{10} Chapter 7 in the Danish Company Act
\textsuperscript{11} http://www.corporategovernance.dk
Genmab employs a board of directors that is in charge of both monitoring and setting the strategic direction. The board is comprised of nine directors, of which three are employee-elected representatives, while the remaining directors are labelled independent. There is, however, a difference between meeting the official requirements for being independent and being truly independent.

<table>
<thead>
<tr>
<th>Name</th>
<th>Educational Background</th>
<th>Tenure</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedersen, A.G. (CoB)</td>
<td>Medical Sciences</td>
<td>11</td>
<td>Independent</td>
</tr>
<tr>
<td>Malkiel, B.G.</td>
<td>Economics, Finance</td>
<td>5</td>
<td>Independent</td>
</tr>
<tr>
<td>Widmer, M.B.</td>
<td>Biological Sciences</td>
<td>10</td>
<td>Independent</td>
</tr>
<tr>
<td>Pedersen, K.H.</td>
<td>Law</td>
<td>5</td>
<td>Independent</td>
</tr>
<tr>
<td>Munch-Jensen, H.H.</td>
<td>Economics, Finance</td>
<td>5</td>
<td>Independent</td>
</tr>
<tr>
<td>Wilderbeek, T.</td>
<td>Medical Sciences</td>
<td>1</td>
<td>Independent</td>
</tr>
<tr>
<td>Bruno, D.J.</td>
<td>Economics, Finance</td>
<td>2</td>
<td>Employee-elected</td>
</tr>
<tr>
<td>Vink, T.</td>
<td>Biochemistry</td>
<td>2</td>
<td>Employee-elected</td>
</tr>
<tr>
<td>Losic, N.</td>
<td>Statistics</td>
<td>2</td>
<td>Employee-elected</td>
</tr>
</tbody>
</table>

Source: www.genmab.com

In order to determine the board’s actual level of independence we first look into each director’s tenure on the board because directors are likely to become captured by management as tenure increases. The majority of the directors that are labelled as independent have served for an extended time period with two of them approaching the 12-year maximum. This can have adverse effects in terms of a more lax approach to overseeing the quality of the executive board’s performance. A positive view can also be adopted because longer tenure can be expected to facilitate improved ability to monitor and make strategic decisions due to a higher level of understanding of the business model acquired over time. Past changes to the executive board reveals that Genmab’s board of directors replaced the co-founding CEO, Lisa Drakeman, in June 2010 as a result of poor performance (Steensgaard, June 15th 2010). This favours actual independence despite the long tenure of several directors.

Both theory on governance of innovation and principal-agent theory predict that complex firms should exhibit less independence by having more insiders on the board of directors. From this perspective, it is somewhat of a surprise that none of the executive board members serve on the board of directors. This is interpreted as a sign that the marginal improvement to the quality of strategic decisions does not outweigh the increased agency cost of insider directors, i.e. it is impossible to monitor yourself.
Genmab has perhaps aimed for a middle way that facilitates both monitoring and strategic management by prioritizing directors with a background within biotechnology and related sciences, which enables the directors to comprehend the technicalities of innovation. In Genmab’s annual statutory corporate governance report for 2011 it is stated that the company deliberately has extended the interval between re-electing directors in order to enhance the company’s strategic direction and stability. Lacetera (2001) emphasizes that social relations are an important part of collective learning and in this sense outside directors serve as a source of new knowledge, both directly through their own capabilities and indirectly through their network. In addition, the representation of employee-elected directors ensures that insiders to the learning process participate in the strategic decision-making. The presence of the head of molecular biology, Tom Vink, and the director of biometrics, Nedjad Losic, are particularly good examples of insiders that can empower the board to shape innovation in response to opportunities and threats, as proposed by O’Sullivan (2000).

The executive board has a high proportion of individuals with a background and experience within sciences related to the research and development of new drugs. For instance, the CEO, Scientific Director, and VP of Clinical Development have in total authored +500 scientific papers and obtained over 90 patents.

<table>
<thead>
<tr>
<th>Title(s)</th>
<th>Name</th>
<th>Educational Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-founder, President, CEO</td>
<td>van de Winkel, J.G.J.</td>
<td>Medical Sciences</td>
</tr>
<tr>
<td>Executive Vice President, CFO</td>
<td>Eatwell, D.A.</td>
<td>Accounting, Finance</td>
</tr>
<tr>
<td>Sr. Vice President, Scientific Director</td>
<td>Parren, P.W.H.I.</td>
<td>Medical Sciences</td>
</tr>
<tr>
<td>Sr. Vice President, IPR &amp; Legal</td>
<td>Stephensen, B.</td>
<td>Law, Pharmaceutical Sciences</td>
</tr>
<tr>
<td>Sr. Vice President, Clinical Development</td>
<td>Bauer, M.K.</td>
<td>Physiology</td>
</tr>
<tr>
<td>Sr. Vice President, IR &amp; Communications</td>
<td>Gravesen, R.C.</td>
<td>Communication, Journalism</td>
</tr>
<tr>
<td>Sr. Vice President, Global Finance</td>
<td>Pagano, A.</td>
<td>Accounting, Finance</td>
</tr>
</tbody>
</table>

Source: www.genmab.com

Theory on governance of innovation suggests that empowering individuals with technical expertise and experience and/or insiders to the learning process is an important part of collective learning and successful innovation. Genmab’s CEO, Jan van de Winkel, is an example of this as he previously held the position as chief scientific officer (CSO) at Genmab while also serving as a professor in immunology at Utrecht University. During his time as CSO Van de Winkel was one of architects behind the development and commercialization of Genmab’s only marketed product, Arzerra (Lassen
and Svansø, June 16th 2010). The presence of a designated scientific director is another example of how Genmab links leadership roles to the learning process. On a side note, the fact that the executive board is heavily focused on technical expertise might also explain why the board of directors has a similar composition. That is, the directors must possess significant expertise and status within research in order to have leverage in discussions with executives over strategic decisions affecting innovation.

The executive board is paid a fixed salary coupled with an annual cash-bonus and share-based incentives through participation in a warrant programme. Genmab states that this composition ensures that short-term objectives will be considered in conjunction with the long-term ones. The remuneration policy for the executive board is not unusual, since it is what one should expected for an innovative organization based on both the presented theory on remuneration and Anderson et al’s (2000) empirical study of IT companies.

According to data retrieved from the company database Orbis, four investors hold a share of 5 percent or more in Genmab. The Danish Government through its funds, GlaxoSmithKline, Johnson & Johnson Development Corporation, and a private investor, Hendrikus Hubertus Franciscus Stienstra, are the biggest shareholders with approximately 10 percent each. Lacetera (2001) argues that concentrated ownership is a source of financial commitment but this is not supported, nor contradicted, in this case because Genmab yet is to raise cash through an FPO or rights issue\textsuperscript{12}.

One explanation to this is that the company has been very successful in setting up out-licensing agreements, which suggests that out-licensing is preferred over the equity market.

The fluctuation in Genmab’s share price over the past ten years is presented in \textbf{figure 7}. It shows that the company experienced a steep increase in value during the middle of the 2000s, with a peak around DKK 400 per share. By the beginning of September 2012 the share price was down by nearly 80 percent at DKK 80 per share.

\textsuperscript{12} FPO is a follow-up public offering. Rights issue is an offering of additional securities to existing shareholders, often at a discount relative to the prevailing market price.
Figure 7 - Genmab Share Price 09/2002 to 09/2012 (source: www.genmab.dk)

The peak share price in late 2006 resulted from the announcement of the DKK 12bn partnership agreement with GlaxoSmithKline. However, between 2007 and 2010 the combination of less encouraging trial results for the drug underlying the agreement with GSK and the occurrence of the global financial crisis contributed to a sizeable decline in Genmab’s share price. In June 2010 the co-founder and CEO, Lisa Drakeman, was replaced with Jan van de Winkel following the company’s poor performance.

The fluctuating share price is not necessarily a sign that Genmab is doing something wrong but rather a result of what Martin Bonde from Dansk Biotek refers to as the nature of biotech. Essentially, this comes down to the high degree of uncertainty and resulting risk associated with the development of drugs (Rode 2012). Companies have no way of knowing ex ante how trials with a new product will turn out and are obligated to report all findings. This will naturally magnify the ups and downs in the share price since a negative trial outcome can mean the end of a massive investment, whereas a positive result can lead to steady revenue streams worth billions. Hence, the quality of Genmab’s management should be judged against the ability to continuously come up with new promising product candidates and funding for such efforts.

Implications for Governance of Innovation

Genmab exhibits all of the conditions that O’Sullivan (2000) presents as fundamental to any system of corporate governance in innovative firms. Specifically, Genmab seeks financial commitment from
strategic partners with resources and incentive to commit to innovation. Out-licensing is found to be a natural source of financial commitment, and it is suggested that this type of financing is preferred over the equity markets. The structure of out-licensing agreements results in monitoring because the payment of milestones depends on meeting objectives that coincide with enhancing shareholder value. Furthermore, licensees are found to be good candidates for such monitoring because they have economic incentives, technical know-how, access to insider information, and control rights that together is a credible threat to management.

Genmab is found to emphasize traits that facilitate collective learning such as cross-functional interaction, knowledge sharing and the presence of employee-elected directors on the board. As proposed by O’Sullivan (2000), commitment to the learning process is encouraged through allowing scientists and researchers to realize part of the gain from innovation via compensation packages that include a share-based component.

There is found no overlap between the executive board and the board of directors as otherwise proposed by Lacetera (2001). This is interpreted as if the incremental benefit from insiders’ superior knowledge of the learning process is outweighed by the costs of less efficient monitoring. It is also a sign of the value that external relations can bring in the form of new resources.

In conclusion the most significant finding is the importance of strategic alliances due to their provision of financial commitment, complementary assets and incentive to drive innovation forward, which makes them a natural candidate for having control. Consequently out-licensing agreements appear to contribute a great deal to a good system of corporate governance of innovation.

5.2 – Case 2: Topotarget

In 2000, Topotarget was founded by a group of clinicians focusing on molecular mechanisms for the treatment of various forms of cancer. Since its inception the company has successfully developed and marketed one drug (Savene/Totect) which, however, was sold off to Apricus Biosciences in December 2011. Topotarget is currently channelling all resources into the development of a single promising oncology drug candidate, Belinostat. The development is part of an out-licensing agreement with
Spectrum Pharmaceuticals formed in 2010 under which Spectrum has received North American and Indian rights for Belinostat. In return, Topotarget has received a USD 30m upfront payment and entitlement to milestone payments and future royalties. Spectrum fully absorbs the cost of ongoing trials while future clinical trial costs will be split 70/30 between Spectrum and Topotarget.

Topotarget states that the business model is rooted in a strong track record of alliances with major pharmaceutical companies, biotech firms, and academic institutions. Successful partnerships are used to reduce financial and commercial risk via their provision of financing and complementary knowledge. For instance, the press release accompanying Topotarget’s announcement of the out-licensing agreement with Spectrum Pharmaceuticals suggests the partner’s expertise in marketing and commercializing pharmaceuticals as particularly valuable. Following the announcement, Topotarget’s share price jumped 63 percent from DKK 2.84 to DKK 4.64 per share. This is a clear indication that investors’ anticipated the collaboration to induce a higher ability and/or probability of value enhancement. The role of alliances as a vehicle for collective learning is also backed by Topotarget’s current academic partnership with the National Cancer Institute (US) as well as a previous collaboration agreement with Danish national hospital Rigshospitalet.

The following walkthrough of Topotarget’s financial situation as of December 31st 2011 will go into details with the role of out-licensing in terms of financing and corporate governance.

- Cash position, end of December 2011: DKK 114m
- Monthly cash burn rate for 2011: DKK 7.33m
- Assumed constant cash burn rate

Based on these figures (Annual Report 2011), Topotarget needs additional cash preparedness within 16 months in order to continue the development of Belinostat. Debt financing is ruled out because the company has a limited tangible asset base and no revenues to cover interest payments. Another possibility is to raise cash via the equity market; using the recorded share price of DKK 2.5 from December 31st 2011, Topotarget would have to issue approximately 35m shares just to finance another year of operation. This amount to a 26 percent increase in the number of shares outstanding, which makes raising cash through issuing equity alone unlikely given that Belinostat still is in phase II trials –

---

13 Company Announcement on February 2nd 2010
which according to estimates from DiMasi et al (2007) leaves at least another 3 years before approval for commercialization.

This is where out-licensing agreements can act as an important source of financing and survival as a going concern. The fact that milestone payments are performance-based also means that success/failure to unlock such payments provides a signal to investors regarding the quality of innovation. In addition, the performance-based structure of out-licensing agreements will automatically weed out bad investments, which benefits both the licensee and the shareholders. Generally, out-licensing agreements with big pharmaceutical firms (licensees) are argued to have a positive impact on corporate governance because a licensee has an economic incentive that is highly correlated with the final outcome of a given drug programme. Consequently, licensees have incentive to monitor the behaviour of decision-makers and encourage transparency that together help reduce information asymmetry and agency problems that affect shareholder value. For example, the risk that shareholders fall victim to “fake” success in the form of manipulated trial results or positive spin on the prospects of a drug candidate is reduced.

In relation to financial commitment, O’Sullivan’s (2000) view of innovative organizations implicitly assumes that innovation only is a subset of the company’s activities, and that financial resources already are present within the firm. From this perspective, the approach is less suitable for innovative firms that starve cash because its focus mainly concerns how to ensure that internal decision-makers will allocate resources to innovation. Biotech firms are formed for the purpose of creating novel drugs and must hence be assumed to have the incentive to innovate; however, they are often constrained on cash. Big pharmas share the incentive to commit to innovative investments while also having the resources to do so. In this light, the principal’s decision to give up some level of control to external agents appears natural.

This use of external partners as a means to empower combined value creation and a financial commitment is in line with the predictions made by Lacetera (2001). The downside to the importance of alliances is the risk that a partner fails to commit the necessary resources to the agreement. Hold ups are another potential risk to out-licensing agreements because the licensee typically has the right to terminate the agreement. This puts the licensee in a position to threaten the biotech firm to accept less favourable terms in order to maintain the flow of financing. However, big pharmaceutical firms rely on
a reputation as good partners as a means to secure the most promising drug candidates among the many small biotech firms. Therefore, these downsides of partnerships must be argued to be less apparent than the positive ones described above.

Organizational Integration and Collective Learning

In order to reduce the exposure to development risk, Topotarget has established a global oncology advisory board that interacts with managers and scientists and make recommendations for drug trials and related decisions. Topotarget has also formed a scientific committee consisting of board members and key employees in an effort to mitigate developmental and commercial risk through cross-disciplinary interaction. Both of these measures are intended to include insiders from the learning process in the decision-making, which resembles Lacetera’s (2001) suggested approach to enhancing collective learning.

Topotarget provides long-term incentives to employees in the form of warrants\(^\text{14}\), which supports O’Sullivan (2000) who mentions share-based incentives as a powerful, and perhaps even necessary, mechanism for encouraging long-term commitment. On the other hand, Core et al (2003) actually argue that it is largely inefficient to tie the pay of employees below the management level to firm performance due to the average worker’s limited ability to affect final outcomes. However, non-executives at biotech firms, such as scientists, have a significant role in identifying promising disease targets, drug candidates etc., which ultimately is directly linked to firm performance. This suggests that innovative firms must be more aware of agency problems internal to the organization than it is the case for more traditional manufacturing industries.

The board of directors combines the role of monitoring with the strategic management of the company. Its composition is dominated by directors with a technical background relevant to the development of drugs and all board members except Per Samuelsson are defined by Topotarget as being independent. Mr. Samuelsson does not count as independent because he servers as partner at a venture capital fund with a large position in Topotarget.

\(^{14}\) Company Announcement on May 2\(^\text{nd}\) 20012: 1.025,000 warrants were issued of which 54 percent related to employees not considered as being part of the executive team or the board of directors.
On the 30th of August 2012, the board of directors decided to remove the CEO, Francois Martelet, less than 3 years into his tenure. The chairman of the board openly declared the decision to be move towards maximizing shareholder value (Grøndal, August 30th 2012a). This scenario corresponds to Hermelin and Weisbach’s (2003) finding that boards with independent directors are more likely to replace a CEO following bad performance. The announcement caused a 20 percent drop in share price, which implies that investors either believed that it was a wrong decision or that Martelet was assumed to be doing a better job than he actually was. It is argued that the latter is the case as there are no news stories on investors revolting against the board’s decision to fire the CEO. Consequently, the market’s reaction is interpreted as a sign that the directors’ responded to a negative signal that the overall market had not recognized through its monitoring activity. This suggests that independent directors are a viable source of monitoring even under complex business conditions.

Both principal-agent theory and Lacetera (2001) argue against the above finding on independent directors’ ability to monitor. This may derive from the fact that they have overlooked the possibility that other mechanisms can be used to bridge the informational gap between outsiders and insiders. Examples of such mechanisms are the scientific committee and global oncology advisory board as well as the priority given to directors that possess a high level of technical knowledge and expertise. At the same time, these mechanisms also facilitate enhancement of collective learning and ensure that strategic decisions are linked to the process that generates innovation.

The executive board is relatively small with a focus on individuals with some level of technical knowledge. The fact that Topotarget employs a VP specifically in charge of establishing and collaborating with strategic partnerships is a finding that strongly supports the importance of alliances.
Topotarget does not disclose the remuneration policy for the executive board at the individual level but the company does inform that performance pay components include an annual cash bonus and warrants. All performance measures are objective-based and there is no evidence that the company employs behaviour-based incentives.

According to data retrieved from the company database Orbis, the only investor holding more than 5 percent is HealthCap with a total stake of 13 percent of equity. Demsetz and Lehn (1985) find that ownership concentration increases with the noisiness of the industry, which is interpreted as an attempt to increase the flexibility of decision-making and hence empower the ability to respond to the challenges that uncertainty entails. The fact that HealthCap is an experienced Swedish venture capital fund whose investment strategy is to seek active partnership with portfolio companies and to provide strategic advice supports this interpretation.

The fluctuation in Topotarget’s share price since its IPO in June 2005 is presented in **figure 8**. The peak price around DKK 40 per share in August 2006 resulted from the marketing approval for Savene/Totect in the US and EU. The drug did, however, not become the blockbuster that investors had hoped for, which drove down the share price (Johnsen, March 12th 2008). In 2008, Topotarget experienced another steep decline in the share price as the company was forced to fully write-down four failed acquired drug candidates (Annual Report 2008).

**Figure 8 - Topotarget Share Price 06/2005 to 09/2012 (source: www.euroinvestor.dk)**
Implications for Governance of Innovation

Alliances are found to be a valuable source of scientific guidance and financial commitment, and consequently they also provide a disciplining effect in the form of monitoring. Through the case analysis it has become apparent that O’Sullivan’s (2000) theory on governance of innovation perhaps is too limited because it assumes that the primary problem is the allocation of existing internal resources. Biopharma firms are all too often financially constrained and therefore the concept of governance should be expanded to include incentivizing external agents to take part in innovation. Topotarget does so by acknowledging that big pharmaceutical companies have an abundance of cash and an incentive to replenish their pipelines with novel drugs. As a result, insider control is given to external agents in exchange for financing and complementary assets that together serve to enhance shareholder value. Topotarget also employs mechanisms that empower cross-organizational sharing of knowledge and the possibility for insiders from the learning process to provide input to the strategic decisions. This is argued to lend support to the contribution and value of collective learning.

As expected by O’Sullivan (2000), Topotarget has been found to primarily encourage the employees’ to make commitment to relation-specific investments by sharing economic rents from innovation through the introduction of a share-based component as part of compensation.

An interesting finding is that the board of directors is dominated by independent directors and not insiders, as proposed by Lacetera (2000) and Linck et al (2008). The company employs several other mechanisms that facilitate the transfer of information from insiders to outsiders, which creates a solid foundation for efficient monitoring and strategic decisions. Finally, strategic partnerships are a natural part of the business model, and with good reason, since out-licensing agreements have been found to be a source of financial commitment, complementary resources, and monitoring.

5.3 – Case 3: Zealand Pharma

Founded in 1998, Zealand Pharma is a biotech company specializing in the discovery and development of peptide drugs for the treatment of diabetic and metabolic diseases. The company has through its own research and development programmes identified a broad pipeline, although, the company is yet to commercialize its first product.
Zealand Pharma mentions the formation of alliances as an essential component of the overall vision of becoming a European technology leader within research and development of peptide drugs. The core values of Zealand Pharma state that strategic partners are fundamental to creating maximum value for its shareholders through collaboration and open communication. Consequently, five of the seven drugs that have reached the clinical stages result from partnerships with big pharmaceutical companies. Zealand Pharma has out-licensing agreements with Abbott, Boehringer Ingelheim, Helsinn Healthcare, and Sanofi. The four partnerships have a combined milestone potential of more than EUR 700m and promises of double-digit annual royalties from successfully commercialized candidates. The partners also cover all costs associated with research, development, and commercialization. The agreement with Boehringer Ingelheim also includes financing for the discovery of drug candidates similar to the one underlying the existing licensing agreement.

Zealand Pharma’s strategy distinguishes between end-users and costumers; although the patient is the end-user then big pharmas are considered to be the actual costumers to target. The annual report from 2011 specifically mentions such partnerships as a method to de-risk the business model and build shareholder value. The ultimate goal of the business strategy is to use partnerships in the short-term to finance development of drug candidates and achieve long-term sustainable profitability through royalties. This finding does lend some support to O’Sullivan’s (2000) statement that insider control over strategic decisions should be vested (within the organization) in the hands of those with incentives and ability to allocate resources to innovative investments. This is inferred because Zealand Pharma’s business strategy actively targets big pharmaceutical companies that have both incentive to replenish
their pipeline and the money to do so. The preferences of big pharmaceutical companies can therefore be said to indirectly control Zealand Pharma’s choice of drug candidates, i.e. investment decisions. Moreover, once an out-licensing agreement has been signed the partners also exert direct control over the development through contractual rights.

In fact, not being able to gauge what type of research programmes that interests current and potential partners is by Zealand Pharma mentioned as a source of risk to shareholder value. Therefore, it is concluded that the role of strategic alliances goes far beyond merely being vehicles to promote collective learning. A licensee with control rights for a specific drug programme has incentive to accompany the shareholders in monitoring investment decisions in order to increase the probability of receiving a return on investment.

Organizational Integration and Collective Learning

Zealand Pharma refers to the positive impact of sharing expertise, knowledge and gaining access to new technology within drug development as an important driver for engaging in strategic partnerships. Specifically, the criteria for success of strategic alliances are that they add new insight, understanding and expertise that can complement in-house activities, e.g. empowering novel discoveries via dialogue and collaboration with biotech and pharmaceutical companies. These mentioned benefits echo the conditions that O’Sullivan (2000) put forward as being essential to collective learning and organizational integration. The implication for corporate governance is that the organization must accept to relinquish some level of control over investment decisions to outsiders in return for improved ability to create innovative outcomes.

Another mechanism that facilitates collective learning is the Clinical and Scientific advisory board established in November 2011, which is seated by internationally renowned experts within Zealand Pharma’s field of research. The advisory board’s foremost duty is to supply project leaders and researchers with objective evaluations of the applied scientific methods and ongoing clinical programmes. Furthermore, collaboration with academics is seen as a gateway to some of the most influential investigators and new technology within chosen disease targets. This is a finding, which
supports that social relations are an important factor to successful innovation as proposed by Lacetera (2001).

Zealand Pharma’s organizational structure also highlights the payoff from cross-functional project teams. The integration of different line functions is seen as a way to ensure flexibility and interdisciplinary knowledge sharing among discovery and drug development units. This allows for an iterative process where feedback loops ensure progress, which is a finding that once again underlines that collective learning is an essential part of innovation.

Zealand Pharma encourages short and long-term commitment through a warrant program for its employees. Hence, the power of economic incentives is, as argued by O’Sullivan (2000), an important means to retain and attract first-rate talent and empower long-term shareholder value creation.\(^{15}\)

Zealand Pharma employs a board of directors that is comprised of ten members. Dr. Munoz is non-independent due to his roles as co-chair of the Clinical and Scientific advisory board. Three directors are employee-elected insiders while the remaining board members are labelled independent.

<table>
<thead>
<tr>
<th>Name</th>
<th>Educational Background</th>
<th>Tenure</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lindegaard, J. (CoB)</td>
<td>Business</td>
<td>1</td>
<td>Independent</td>
</tr>
<tr>
<td>Ellens, D. J.</td>
<td>Molecular Biology</td>
<td>7</td>
<td>Independent</td>
</tr>
<tr>
<td>Benson, P.</td>
<td>Business and Economics</td>
<td>5</td>
<td>Independent</td>
</tr>
<tr>
<td>Munoz, A.</td>
<td>Medical Sciences</td>
<td>5</td>
<td>Non-Independent</td>
</tr>
<tr>
<td>Reinaud, F.</td>
<td>Investment, Medical Sciences</td>
<td>3</td>
<td>Independent</td>
</tr>
<tr>
<td>Rosenberg, J.</td>
<td>Accounting</td>
<td>1</td>
<td>Independent</td>
</tr>
<tr>
<td>Owen, M. J.</td>
<td>Biochemistry</td>
<td>1</td>
<td>Independent</td>
</tr>
<tr>
<td>Størrum, H.</td>
<td>Economics</td>
<td>4</td>
<td>Employee-elected</td>
</tr>
<tr>
<td>Thorkildsen, C.</td>
<td>Pharmaceutical Science</td>
<td>7</td>
<td>Employee-elected</td>
</tr>
<tr>
<td>Bak, H. H.</td>
<td>Pharmaceutical Science</td>
<td>1</td>
<td>Employee-elected</td>
</tr>
</tbody>
</table>

Source: www.ZealandPharma.com

It should be noted that Mr. Ellens, Mr. Benson, and Mr. Reinaud all sit on the board as a result of their affiliation with equity owning (+5 percent) private equity/venture capital firms Life Sciences Partners, Sunstone Capital, and CDC Innovation respectively. Consequently, it can be argued that they are not

\(^{15}\) Company Announcement on February 10\(^{th}\) 2012
truly independent. The extent to which this will give rise to conflicts of interest is questionable since venture capitalists and private equity investors aim at maximizing their own and hence also shareholders’ return. From this point of view the direct presence of such investors on the board of directors is in fact more likely to lead to increased monitoring rather than self-dealing.

The directors’ respective area of expertise reflects that priority has been given to individuals with specific knowledge of the biotech and pharmaceutical industries either through education and/or previous work experience. This is interpreted as a mechanism that supports the independent directors’ ability to monitor and interact with insiders from the processes that generate innovation. It also supports the board’s ability to be a source of advisory and resource-provision (Hillman et al, 2008). Two other mechanisms that facilitate communication between strategic decisions and the innovative process are the employee-elected directors and Dr. Munoz’s double role as director and co-chair of the scientific and clinical supervisory board. That is, they both provide an opportunity for insiders from the learning process to influence resource allocation decisions.

Thus, the board composition is found to favour the monitoring duty while Zealand Pharma employs several other mechanisms that support the strategic decision-making and resource-provision role. The latter role is supported further by the presence of Jørgen Lindegaard, former CEO of airline SAS, whose foremost duty since his appointment has been to calm down Zealand Pharma’s investors (Nymark, May 1st 2012; Venderby, April 8th 2012).

The executive board exhibits a significant presence of individuals with a relevant technical background. The only member without a technical background is the CFO who holds a degree in business administration.

<table>
<thead>
<tr>
<th>Title(s)</th>
<th>Name</th>
<th>Educational Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>President, CEO</td>
<td>Solomon, D. H.</td>
<td>Medical Sciences</td>
</tr>
<tr>
<td>Sr. Vice President, CFO</td>
<td>Blom, M.</td>
<td>Business Administration</td>
</tr>
<tr>
<td>Executive Vice President, Scientific Director</td>
<td>Grøndahl, C.</td>
<td>Medical Sciences</td>
</tr>
<tr>
<td>Sr. Vice President, COO</td>
<td>Hyttel, J.</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>Sr. Vice President, Chief Business Officer</td>
<td>Hundal, A. M.</td>
<td>Genetics</td>
</tr>
</tbody>
</table>

Source: www.ZealandPharma.com
The senior VP and COO, John Hyttel, is also a co-founder of Zealand Pharma and he has previously been head of R&D at both Zealand and H.Lundbeck. Thus, he must be regarded as a true insider to the actual processes of innovation. This is in line with theory on governance of innovation’s prediction that control should be given to individuals who are insiders to the learning process in order to facilitate the dispersion of knowledge and collective learning.

The Scientific Director, Christian Grøndahl, joined Zealand Pharma from a position as head of a corporate development unit at Novo Nordisk focusing on strategic partnerships between biotech and pharmaceutical. The decision to hire a scientific director that has vast experience in establishing strategic partnerships underlines the importance of alliances to the business model.

The compensation policy for the management follows the expectations of principal-agent theory that proposes a combination of fixed salary plus variable components that depend on both short and long-term performance measures. Specifically, the management participates in a warrant programme and receives cash bonuses based on short-term targets such as achieving milestones.

According to ownership data from Orbis, Zealand Pharma has six shareholders with blocks above 5 percent. The most dominant ones are Sunstone Capital (30 percent), Maj Invest (12 percent), Lønmodtagernes Dyrtidsfond (12 percent), CDC Innovation (11 percent), and Life Sciences Partners (8 percent). Demsetz and Lehn (1985) find that ownership concentration increases with the noisiness of the environment in which the firm operates in. This is interpreted as if there is a payoff to having tight control under uncertain conditions via improved monitoring but also due to an increased flexibility to react to changing conditions. In this light, the significant presence of venture capitalists and private equity firms is noteworthy because this type of investors typically employs an active ownership approach to managing investments (Heel and Kehoe, 2005).

It can be argued that the 30 percent equity-stake held by Sunstone Capital can lead to adverse effects. In an interview with Børsen in 2007 the former CEO, Eva Steiness, alludes to this fact as she expresses her dissatisfaction with especially one venture fund that in her opinion had too much power in setting too ambitious targets to the management (Larsen 2007). It is difficult to assess if this is in fact the truth or if Eva Steiness simply was bitter about being replaced. The fact that Zealand Pharma has several other blockholders that together have voting rights exceeding that of Sunstone Capital does however
imply that other investors would have been able to intervene if needed. The company has not used the concentrated ownership as a source of financing, which is argued to be due to a very strong portfolio of out-licensing agreements.

Since the IPO in November 2010 the share has exhibited volatility from an IPO price of DKK 86 per share to an all-time low of DKK 40 in November 2011.

Interestingly enough Zealand Pharma’s management was awarded the title Management Team of the Year (biotech category) by SCRIP World Pharmaceutical News for its work during the period from June 2010 to May 2011. Zealand Pharma’s transparent communication strategy and ability to continuously create results were mentioned as the key reasons for winning the award\(^\text{16}\). The fact that Zealand’s management according to experts is doing a good job only underscores the fact that the conservation of shareholder value to a certain extent is outside management’s control due to the risky nature of the biotech industry. For instance, there is a significant jump from DKK 70 to DKK 85 per share during February and March 2012; during this period Zealand Pharma received a USD 20m milestone payment from Sanofi following successful phase III trials. During the same period it was also announced that the drug co-developed with Helsinn would progress to phase II trials.

In addition to this, the spike in May 2012 followed from the announcement of the licensing agreement with Abbott. It has however not been possible to find any documents explaining why the share price

\(^{16}\) http://ir.zealandpharma.com/releasedetail.cfm?ReleaseID=620942
declined to the DKK 90 level per share shortly after. One explanation could be that investors were realizing their returns following the large gain between November 2011 and May 2012.

**Implications for Governance of Innovation**

The case provides findings that highlight the importance of out-licensing in terms of financial commitment. It is a means to de-risk the business model because partnerships allow the company to transfer risk to outsiders and invest in a more diversified pipeline. Zealand Pharma does also emphasize traits that resemble collective learning as being an important contribution from alliances. The impact on corporate governance is that insider control is granted to licensees, which facilitates monitoring activity.

The findings from Zealand Pharma also show that the company employs several mechanisms that facilitate collective learning such as collaborations with academic institutions, renowned experts, and emphasis on work structures that facilitate sharing knowledge and integrating different capabilities.

Long-term commitment to relation-specific investments is encouraged through share-based incentives that vest over time and only are valid as long as the holder is employed by Zealand Pharma, which is line with the expectations of O’Sullivan (2000).

There is found no overlap between the executive board and the board of directors as otherwise predicted by Lacetera (2001) and Linck et al (2008). The extent to which the directors are truly independent is however questionable but despite this fact the composition still emphasizes the monitoring role. The board’s closeness to the learning process is facilitated by including employee-elected directors and the presence of Dr. Munoz who is an active part of innovation due to his role as co-chair of the clinical and scientific advisory board.

In conclusion it can be said that the Zealand Pharma case supports that the organizational structure of biopharma firms should facilitate the dispersion of knowledge. The composition of the board of directors emphasizes the monitoring role. The board’s ability to make informed strategic decisions and
act as advisors is facilitated through prioritizing technically knowledgeable individuals and employing mechanisms that facilitate closeness to the process that generates innovation. Finally, out-licensing agreements are found to be a very valuable source of both financing and reduced agency costs.

5.4 – Case 4: Bavarian Nordic

Founded in 1994, Bavarian Nordic is a biotech firm that develops and produces viral vaccines for the treatment of cancer and infectious diseases. The company has seven drug candidates in a pipeline that ranges from the pre-clinical stage to phase III studies. The marketed smallpox vaccine, IMVAMUNE, has only passed phase II trials but is currently being sold to the U.S. government for emergency use.

Figure 11 – Bavarian Nordic Product Pipeline (source: www.Bavarian-Nordic.com)

![Graph showing product pipeline stages](source: www.Bavarian-Nordic.com)

Bavarian Nordic has developed a proprietary technology that has been proven to be one of the safest methods for the development and production of vaccines against cancer and infectious diseases. The company aims at leveraging this core competency and strategic advantage by targeting partners that can supplement the in-house research and development programmes. The company does however also seek to establish partnerships with other major pharmaceutical firms that have global or regional specialist capabilities in sales and marketing.

Bavarian Nordic reports of three separate partnership agreements, all with the US government. Two of the partnerships are co-operative and development agreements (CRADAs) with the National Cancer Institute (NCI). Under these agreements Bavarian Nordic has acquired licensing rights for two drug candidates (PROSTVAC and CV-301) that have the potential to treat various forms of cancer. Bavarian Nordic also has the first option rights to exclusively license intellectual property developed through the
collaboration. The NCI finances and conducts selected pre-clinical and clinical trials under the CRADAs while Bavarian Nordic manufacturers and supplies vaccines and finances the trials not paid for by the NCI. Bavarian Nordic’s press release on the announcement of the initial collaboration with the NCI on August 13th 2008 highlights the NCI’s status as a world leading centre of excellence within cancer research. This supports Lacetera’s (2000) proposition that alliances are an important element in achieving collective learning. This assumption is supported by Bavarian Nordic’s decision to split up the development of vaccines for cancer and infectious diseases into independent divisions. That is, it was a move to facilitate better conditions for in-licensing agreements through improved strategic focus of each business unit (TV2 Finans 2010).

The last agreement is with the US National Institutes of Health (NIH) and it involves a set of request for proposal (RFP) contracts17 for the development and delivery of Bavarian Nordic’s IMVAMUNE smallpox vaccine. Under this agreement Bavarian Nordic finances the development and manufacturing of the drug in exchange for the US government’s commitment to take incremental delivery of IMVAMUNE and pay milestones as the drug progresses through the clinical stages. In this case the primary role of the partnership is the financial commitment tied to performance. Bavarian Nordic’s prospects of being awarded a future RFP is entirely dependent on the ability to meet the requirements of the previous contract. In this sense the agreement is similar to a repeated game where the NIH monitors and evaluates the progress of the programme, which induces incentive for Bavarian Nordic to exhibit high effort.

It is, however, difficult to accurately assess these partnerships’ impact on corporate governance because there is limited information available on the division of control between the participants. Although, the fact that the alliance partners are government bodies does give rise to some concerns because they are non-profit organizations whose incentive to innovate is driven by the potential betterment of humankind. Hence, it is argued that potential returns and the cost of capital are given less attention when evaluating drug programmes. Therefore, government-based co-development agreements add limited value in terms of monitoring that ensures behaviour that enhances shareholder value. In fact, it is conceivable that value destroying behaviour (i.e. negative NPV projects) will be endorsed by

17 Company Announcements on September 30th 2004, April 16th 2007, October 12th 2010
a public institution such as the NCI. That is, their objectives are the potential for a scientific breakthrough and reputational gain rather than economic profit.

That cost of capital is a less important matter to public institutions is, however, also likely to make them a good source of financial commitment for companies that pursue research agendas within a government’s areas of interest.

In light of the above discussion it is argued that for profit-entities ideally should be in control of co-development agreements with public institutions. This does in fact also appear to be the employed model in this case since Bavarian Nordic can control which projects to acquire licenses for and develop further.

The case also adds information indicating that the market considers out-licensing agreements to be more important than in-licensing. This is based on the observation that Bavarian Nordic’s management in 2011 used the investors disappoint with the inability to set up an out-licensing agreement for PORSTVAC as an explanation to the 80 percent drop in market value (Annual Report 2011). On the other hand, the announcement of the CRADA with the NCI on August 13th 2008 only contributed with an 8 percent increase of the share price. This indicates that although shareholders do value collective learning then financial commitment is valued higher. It also suggests that current and potential shareholders can use out-licensing agreements with big pharmas as a yardstick for the quality of the innovation. That is, difficulties in finding a commercial partner can be interpreted as a signal of a drug’s dubious commercial and/or scientific potential – and vice versa.

It is of course possible that the sale of IMVAMUNE provides enough expected cash preparedness for Bavarian Nordic to be less concerned with finding a source of financial commitment for PROSTVAC. That is, the RFP contract with the US government entails a base payment of USD 500m with further potential of another USD 1.1bn (Annual Report 2007). However, the fact that Bavarian Nordic has raised cash through rights issues several times and that management openly has declared the intent to out-license weighs against this possibility (Annual Reports 2005, 2007, 2010, 2011).
Organizational Integration and Collective Learning

Bavarian Nordic’s board of directors seats five independent directors while the chairman of the board, Asger Aamund, is non-independent due to his long-standing affiliation with the company and ownership of +5 percent of the company’s shares.

<table>
<thead>
<tr>
<th>Name</th>
<th>Educational Background</th>
<th>Tenure</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aamund, A. (CoB)</td>
<td>Business, Entrepreneurship</td>
<td>18</td>
<td>Non-independent</td>
</tr>
<tr>
<td>Bræstrup, C.</td>
<td>Medical Sciences</td>
<td>4</td>
<td>Independent</td>
</tr>
<tr>
<td>Hansen, E. G.</td>
<td>Accounting, Finance</td>
<td>2</td>
<td>Independent</td>
</tr>
<tr>
<td>Kürstein, P.</td>
<td>Business</td>
<td>1</td>
<td>Independent</td>
</tr>
<tr>
<td>van Odijk, G.</td>
<td>Medical Sciences</td>
<td>4</td>
<td>Independent</td>
</tr>
<tr>
<td>Pedersen, A. G.</td>
<td>Business, Medical Sciences</td>
<td>2</td>
<td>Independent</td>
</tr>
</tbody>
</table>

Source: www.Bavarian-Nordic.com

The company describes the directors as possessing complementary competencies that cover management experience from the international pharmaceutical industry, pharmaceutical R&D, global manufacturing, M&A and alliances. There is a dominant presence of professionals with a combination of technical knowledge and management experience with Claus Bræstrup as the most significant profile. He is the former president and CEO of H. Lundbeck and is described as an accomplished researcher and scholar with more than 125 scientific publications under his belt. This is a finding that supports that external social relations are used to empower collective learning and resource-provision, as proposed by Lacetera (2001) and Hillman et al (2008) respectively.

The fact that there is no overlap between the board of directors and the executive board is taken as an indication of the importance of the board’s monitoring duty. However, communication between strategists and insiders to the process that generates innovation is to a certain extent facilitated by having executives and senior employees attend board meetings (Annual Report 2011).

The executive board’s role is to take care of day-to-day operations of Bavarian Nordic. It is evident from the members’ educational background that the composition favours technical expertise for non-finance roles. CEO Anders Hedegaard’s work experience includes previous managerial experience at ALK-Abello and Novo Nordisk while both divisional presidents, Blom and Laus, have significant work experience with the technical and practical aspect of drug development.
These findings add to governance of innovation’s assumption that the dispersion of knowledge and hence collective learning is empowered by granting insider control to individuals that are close to the learning process.

Bavarian Nordic incentivizes commitment through a combination of annual cash bonuses and share-based incentives in the form of warrants to the executive board and certain employees not part of the executive board (Annual Reports 2008-2011). All employees have also several times received phantom shares with a vesting date three years after the granting date\textsuperscript{18}. This is a clear indication that sharing gains from innovation with the employees that generate it is thought to be a good way to encourage organizational integration, as proposed by O’Sullivan (2000).

According to Orbis the largest owners of Bavarian Nordic are the Danish government (12 percent), the chairman of the board, Asger Aamund, through A.J. Aamund (7 percent), ORBIMED Advisors (5 percent), Bellevue Group (5 percent) followed by three owners holding between 2 percent and 4 percent of the shares. Asger Aamund’s history as shareholder in the firm shows that he was one of the early investors and that he continuously has purchased shares in the company during right issues (Politiken, March 10th 2011). The same conclusion applies to the Danish Government’s holding, which supports Lacetera’s (2001) proposition that concentrated ownership can be a source of financial commitment.

However, according to analysts, Bavarian Nordic’s announcement of a DKK 650m rights issue in 2011 contributed to a 40 percent reduction of the company’s market cap due to the expected dilutive effect (Børsen, March 10\textsuperscript{th} 2011). This shows that rights issues can be an extremely costly source of cash in terms of shareholder value.

---

\textsuperscript{18} A future cash bonus that depends on the share price
Bavarian Nordic’s share performance during the past ten years exhibit significant volatility despite the success of IMVAMUNE. This is as mentioned partially due to the inability to find a partner for PROSTVAC coupled with the decision to raise capital through equity issues in 2005, 2007, 2010 and 2011.

**Figure 12 – Bavarian Nordic Share Price 09/2002 to 09/2012 (source: www.EuroInvestor.dk)**

![Graph showing share price fluctuations from 09/2002 to 09/2012](image)

In fact, the major drops are all associated with the market’s reactions to the initial announcements of intentions to raise cash through rights issues. Consequently, although Lacetera (2000) might be correct in the assumption that ownership concentration leads to financial commitment these findings suggest that this source of financing should be considered inferior to retained earnings, alliances, and when possible also debt.

**Implications for Governance of Innovation**

The case of Bavarian Nordic provides findings that suggest that investors consider out-licensing agreements to be more important than in-licensing. Furthermore, it is argued that co-development agreements with government bodies can give rise to potential conflicts of interest because public institutions are non-profit entities whose focus is the betterment of mankind and not economic profit. Consequently, is argued that control should be vested with the for-profit party to such collaboration.

It is, however, also noted that government institutions can be a good source of financial commitment for the exact same reasons. Government contracts are found to have a disciplining effect because the

---

nature of request for proposal contracts implies a continuous renegotiation based on monitoring of past performance.

It is also found that ownership concentration has been used as a source of financial commitment, as proposed by Lacetera (2001). However, it appears that equity issues can have adverse effect on valuation since shareholders not participating in rights issues have been found to punish such announcements by selling shares. Therefore, it is argued that out-licensing agreements should be preferred over issuing equity when it comes to funding research and development. In fact, it has been found that investors interpret the inability to form out-licensing agreements as a signal of low quality and/or commercial viability of innovation.

The case provides limited information on the approach to reducing development and commercial risk. Hence, it is difficult to make any meaningful conclusions on the extent to which organizational integration and collective learning is emphasized in the internal governance.

There is not found to be any overlap between the executive board and board of directors. All except one director are independent, which indicates that monitoring is valued over closeness to the learning process. However, both the executive board and board of directors are found to be dominated by individuals with technical expertise and experience within drug development, which resemble the assumption that strategist should be able to understand the learning process in order to facilitate innovation. In addition, it enhances the director’s ability to monitor the executive board’s decisions and empowers their advisory and resource-provision role.

5.5 – Case 5: NeuroSearch
Founded in 1989, NeuroSearch is a specialist within the research and development of drugs for the treatment of disorders in the central nervous system. In 2011 NeuroSearch decided to discontinue all activities of their NsDiscovery unit, which was in charge of the company’s discovery research. The change was a move intended to focus all resources on the development of Huntexil for the treatment of Huntington’s disorder. Consequently, the company is left with a small pipeline of three drugs in
clinical phases and an unspecified portfolio of assets from NsDiscovery for out-licensing or divestment (Annual Report 2011).

Figure 13 – NeuroSearch Product Pipeline (source: www.NeuroSearch.com)

The NsDiscovery unit was the vehicle for strategic R&D partnerships with big pharmas Eli Lilly, GlaxoSmithKline, and Janssen Biotech. Under these agreements the alliance partners held first option rights to intellectual property developed within the scope of the respective partnership.

The economic impact of the agreements included an upfront payment to NeuroSearch in cash and equity investments, whereas NeuroSearch absorbed all development costs up to the point that a partner decided to exercise their first option rights. A partner was committed to finance further development, milestone payments, and royalty streams once an option had been exercised. NeuroSearch retained all rights for programmes not acquired by a partner (Børsen, January 29th 2009; Børsen, February 17th 2009; Carroll, August 17th 2009).

The company statements relating to the agreements specify that neither of the partners would be involved in the development process pre-acquisition. The financial impact of the agreements is listed below\(^20\).

<table>
<thead>
<tr>
<th>Partner</th>
<th>Equity Investment</th>
<th>Cash</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>GlaxoSmithKline</td>
<td>EUR 28m</td>
<td>EUR 18m</td>
<td>EUR 46m</td>
</tr>
<tr>
<td>Eli Lilly</td>
<td>EUR 10m</td>
<td>EUR 22m</td>
<td>EUR 32m</td>
</tr>
<tr>
<td>Janssen Biotech</td>
<td>EUR 18m</td>
<td>EUR 12m</td>
<td>EUR 30m</td>
</tr>
</tbody>
</table>

Source: Company Announcements

\(^20\) Company Announcements on December 19th 2003, February 17th 2009, August 17th 2009
DiMasi et al (2007) estimate that the out-of-pocket cost for completing the pre-clinical research phase averages USD 185M (approx. EUR 140m) per approved drug. Comparing this number to the upfront payment made by the partners it is argued that the financial commitment provided by the partnerships was rather limited.

In order to assess the agreements’ impact on corporate governance it makes sense to elaborate a bit on what the differences are between an out-licensing agreement and NeuroSearch’s research agreements.

First of all, the incentive to monitor depends on the level of involvement and economic impact, and therefore a partner’s upfront outlay should be viewed relative to their overall R&D expenditure. The total R&D expenditures for GSK and Lilly amounted to USD 6.2bn and USD 5bn\(^{21}\) for the fiscal year 2011, which indicates that the size of their initial investments in NeuroSearch had a rather limited impact on the overall expenditure.

The licensee to an out-licensing agreement is typically committed to cover all development costs, which adds an ongoing expenditure. This extra cost element incentivizes the licensee to continuously make cost-benefit considerations for continuing the development through a review of the research’s feasibility. Consequently, the partner will respond to both negative and positive signals by either granting milestone payments or withdrawing from the project.

Under NeuroSearch’s research agreements a partner only faces ongoing development expenditures once an option to acquire licensing rights has been exercised. Hence, the partner essentially holds the equivalent of a call option. Now, a call option’s value increases with volatility (risk) and is worthless when the underlying asset ceases to exist (Elton et al, 2011). Therefore, it is argued that the partner will have incentive to encourage NeuroSearch to continue development regardless of the probability of success. As a result, the nature of the agreements implies that partners do not add much value to shareholder value through monitoring. That is, a partner will only respond to positive signals coupled with the fact that their payoff structure diverges from the shareholders’. In fact, it is argued that such agreements in theory have a potentially adverse effect on shareholder value because the cost of failure largely is borne by NeuroSearch. This assumption can of course be contested by the fact the partners have an equity stake that provide some alignment with shareholder value. It is, however, argued that

\(^{21}\) Janssen Biotech is a private company and it has not been possible to access up-to-date financial data
the size of this stake is relatively insignificant compared to overall level of R&D expenses and the potential upside from the success of a risky programme.

Organizational Integration and Collective Learning

The fact that partners are not involved in the early development process means that NeuroSearch does not enjoy the benefit of scientific input to innovation, which Lacetera (2001) suggests to be a valuable source of collective learning. Overall, NeuroSearch does not provide much information that suggests that the company emphasizes the values of collective learning as a means to facilitate innovation. The inability to attract and retain talented individuals is, however, mentioned as a risk factor to scientific development. NeuroSearch attempts to mitigate this risk by offering all employees a competitive compensation package that includes a warrant programme. This is, as proposed by O’Sullivan (2000), a method to encourage commitment to innovation since it allows the employees to receive part of the gain from their relation-specific investments.

The board of directors consists of eight members. Five are shareholder-elected, of which one is non-independent, and the remaining three directors are employee-elected. An interesting discovery is that the non-independent director, Allan Andersen, is the chairman of the audit committee. However the fact that Allan Andersen has several other directorships indicates that his full-time occupation is being a director. This is argued to alleviate the potential risk of Mr. Andersen’s long tenure because his livelihood relies on his reputation as an objective and professional board member.

<table>
<thead>
<tr>
<th>Name</th>
<th>Educational Background</th>
<th>Tenure</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hofman-Bang, T. (CoB)</td>
<td>Accounting</td>
<td>4</td>
<td>Independent</td>
</tr>
<tr>
<td>Andersen, A.</td>
<td>Accounting</td>
<td>23</td>
<td>Non-independent</td>
</tr>
<tr>
<td>Bjerke, T.</td>
<td>Medical Sciences</td>
<td>6</td>
<td>Independent</td>
</tr>
<tr>
<td>Talmage, I.</td>
<td>Marketing</td>
<td>3</td>
<td>Independent</td>
</tr>
<tr>
<td>Ullman, A.</td>
<td>Medical Sciences</td>
<td>4</td>
<td>Independent</td>
</tr>
<tr>
<td>Nielsen, M. H.</td>
<td>IT</td>
<td>1</td>
<td>Employee-elected</td>
</tr>
<tr>
<td>Madsen, L. S.</td>
<td>Medical Sciences</td>
<td>8</td>
<td>Employee-elected</td>
</tr>
<tr>
<td>Korsgaard, M. P. G.</td>
<td>Molecular Biology</td>
<td>4</td>
<td>Employee-elected</td>
</tr>
</tbody>
</table>

Source: www.NeuroSearch.com
The tenure of the other independent board members does not give rise to any immediate concerns regarding independence, which is backed by the fact that the current board made a strategic decision to replace former CEO Patrick Dahlen. He was initially hired in 2010 because NeuroSearch needed a CEO experienced with commercializing drugs; however, as the FDA declined approval of Huntextil the strategic focus changed from commercialization to raising finances for further research and clinical trials (Børsen, 27th June 2012).

Four of the eight directors have an educational background within relevant technical disciplines while all the directors as a group cover drug development (Bjerke and Ullman), commercialization (Talmage), as well as in-depth knowledge of financing and financial markets (Andersen and Hofman-Bang). This supports the board’s role as counsellors and strategic advisers (Hillman et al, 2008).

There is, however, no overlap between the executive board and the board of directors, which indicates that unbiased monitoring is a priority. The inclusion of employee-elected directors does however bridge the gap between the process that generates innovation and strategic decisions. Especially the presence of Lars Siim Madsen who is a VP of project and portfolio management is a good example because he inarguably is an insider to the learning process, as proposed by Lacetera (2001).

The discontinuation of the NsDiscovery unit led to a downsizing of the executive board to an initial size of four members, which later became three when Patrick Dahlen was replaced with CFO René Schneider.

<table>
<thead>
<tr>
<th>Title(s)</th>
<th>Name</th>
<th>Educational Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO, CFO</td>
<td>Schneider, R.</td>
<td>Economics</td>
</tr>
<tr>
<td>Executive Vice President, Chief Business Officer</td>
<td>Sørensen, F. E.</td>
<td>Pharmacology</td>
</tr>
<tr>
<td>Executive Vice President, Chief Development Officer</td>
<td>Garre, K.</td>
<td>Medical Sciences</td>
</tr>
</tbody>
</table>

Source: www.NeuroSearch.com

According to the corporate website the two executive presidents both have significant technical expertise and knowledge. Karin Garre has a long track record as medical director from the pharmaceutical firms Novo Nordisk and Nycomed and a role as vice president at fellow biotech firm Genmab. Finn Eggert Sørensen also has several years of experience in product development and
management experience from several smaller biotech and pharmaceutical companies. This is in line with the expectations of both Lacetera (2001) and O’Sullivan (2000). They propose that both collective learning and commitment to innovation is facilitated through granting decision-making power to individuals close to the learning process. It is, however, also a finding that emphasizes the need for decision-makers to have the necessary managerial experience to make important decisions and lead others.

René Schneider who has an educational background and work experience in finance and economics is somewhat of an exception. However, he previously served as head of corporate finance at Novo Nordisk, and at the time of his appointment at NeuroSearch the company had reached a stage where the possible options were to be acquired or look for further financing. Either way the task ahead would emphasize aspects that Schneider had experience with and in this light his appointment as CEO in 2012 was a strategically sound choice.

The executive board is paid a combination of a fixed salary, annual cash bonuses and warrant issues, which according to NeuroSearch ensures that the executive board members a rewarded based on their ability to create shareholder value.

According to Orbis, Neurosearch has two investors with ownership above 10 percent, Luxor Capital Group (>10 percent) and Porter Orlin LLC (10,11 percent), while the Danish Government through its funds, and Glaxo Group both hold approximately 5 percent each. Luxor Capital Group and Porter Orlin LLC are both US based hedge funds. This is a type of investor that has been found to be effective in reducing agency costs based on an activist approach to investment, a large fraction of overall control rights, and limited regulatory constraints (Boyson and Mooradian, 2010).

NeuroSearch has on three occasions raised capital via rights issues. The Danish Government has maintained or increased their percentage ownership during each of these offerings while former blockholding investor Asger Aamund also subscribed to a rights issue made in 2007. This supports Lacetera’s (2001) proposition that ownership concentration can be a source of financial commitment. However, the rights issues made on October 31st 2007 and October 19th 2009 were associated with 30

---

22 Company Announcements on: September 18th 2006, October 31st 2007, October 19th 2009
23 Company Announcement on November 1st 2007
percent and 60 percent discounts respectively relative to the prevailing market price. In both cases the market price converged to the level of the price offered in the rights issue within 10 days following the announcements. This shows that equity financing through rights issues is an overly expensive source of cash in terms of shareholder value.

Over the past ten years the share price has exhibited significant volatility (see next page). The 45 percent drop in August 2005 was a consequence of Boehringer Ingelheim’s decision to end their commitment to an out-licensing agreement on drug for the treatment of Alzheimer’s and Parkinson’s diseases. This caught the investors and NeuroSearch’s management by surprise, since the drug up to this point had provided positive trial results and was about to progress to phase III clinical trials. In the annual report for 2005, NeuroSearch expresses their disappointment with the partner’s decision while also declaring intent to continue the development without Boehringer Ingelheim. The reason for withdrawing from the agreement was that the otherwise positive results from a phase II “test-of-proof” study did not meet Boehringer Ingelheim’s criteria for continuing the development (Berlingske Business, August 10th 2005). This observation supports that licensees indeed serve as a source of monitoring but it also shows that it is up to the shareholders to choose how to react to positive and negative signals.

![Image of NeuroSearch Share Price 09/2002 to 09/2012](source: www.EuroInvestor.dk)

The 50 percent cumulative increase during December 2006 was caused by the combination of several positive trial results while the 30 percent increase during September 2007 relates to positive phase II

---

24 Company Announcement on August 10th 2005  
25 Annual Report 2006
results. These are good examples of how the nature of biotech development is inherently risky with share price volatility to follow.

During the 4th quarter of 2012 NeuroSearch was forced to write down Huntexil to the value of 0. The company did, however, manage to sell the rights for further development to Israeli generic-drug manufacturer Teva for a price of DKK 200m. Following this announcement several banks have decided to discontinue their coverage of the company as they expect the business to be fully dismantled within the coming 12 months (Børsen, December 3rd 2012).

Implications for Governance of Innovation

The case of NeuroSearch provides findings that contradict the expectation that innovative companies should prioritize insiders on the board of directors, which is interpreted as a sign that reliable monitoring is a priority. The presence of employee-elected directors does, however, bridge the gap between strategists and the insiders to the process that generates innovation. It is also found that research agreements that involve an upfront payment in exchange for first option rights to intellectual property have a pay-off structure that is similar to a call option. Therefore, this type of strategic alliances can have potentially adverse effects on shareholder value because the holder of the option has economic incentive to encourage further development irrespective of the risk. This can also affect the management’s incentives because it will take a potential blockbuster drug to make partners exercise an option, which in turn will encourage the selection of disease targets that fit this description. However, this also implies an incentive to invest primarily in cutting-edge drug candidates that have higher risk of failure. In fact, co-founder and former blockholding investor Asger Aamund posits that part of the explanation to NeuroSearch’s looming bankruptcy is that the investment strategy has been too focused on high risk/high payoff drug programmes (Grøndal, August 30th 2012b).

26 Company Announcement on September 17th 2007
Chapter 6 – Cross-Case Comparison
This section will formulate an answer to the overall research question, whose aim is to uncover traits of good corporate governance of biopharmaceutical firms. This is accomplished by answering the study’s sub-questions through a cross-case comparison of the findings on the parameters that were identified for the data collection, i.e. Alliances, Product Portfolio, Risk Management, Compositions of the Board of Directors and Executive Board, Executive Compensation, and Ownership Structure.

Appendix A provides a schematic overview of the findings.

In identifying elements of good corporate governance, it is kept in mind that case studies cannot be used as evidence that confirm or reject a statement. Instead, the objective is to formulate tentative hypotheses (i.e. recommendations) based on the cases that through further research can be validated and tested. The approach is to identify patterns in the employed governance mechanisms by viewing them relative to firm performance.

Share price was initially considered as a performance measure since corporate governance’s duty essentially is to protect shareholder value. However, the case studies indicate that even companies that by experts are considered to be excellently managed also suffer from shocks as a result of the industry’s innately high risk level. This fact has weighed heavily in the decision to argue against using share price as the primary measure of performance. Instead, inspired by Makri et al (2006), it has been decided that industriousness in terms of pipeline width and depth serves as a good proxy for innovative performance. That is, the case companies’ ability to sustain a continuous flow of new drug candidates, and the ability to progress existing ones towards approval.

Genmab, Zealand Pharma, and Bavarian Nordic have broad pipelines that range from early discovery to phase III studies and marketed products. Topotarget does have a very limited pipeline but the company is argued to have a track record of success in terms of innovative capability, i.e. one marketed drug within seven years of the company’s inception. For these reasons, this group of companies are considered to be more successful. NeuroSearch, on the other hand, is considered a clear example of an underperforming biopharmaceutical firm with no marketed products since its inception more than 20 years ago. The current status of the company involves a looming bankruptcy, a small pipeline, and a history of poor ability to push drug candidates through the development stages.
6.1 – Answer to Sub-Question 1: How do biopharmaceutical firms’ corporate governance structures resemble principal-agent theory?

As presented in section 2.1.1, principal-agent theory offers several mechanisms to counter the agency costs associated with the separation of ownership and control. Common for the existing literature on these mechanisms is that it focuses specifically on the agency dilemma arising between owners and managers. For this reason, the answer to the first question will focus on the role of monitoring and incentive alignment of the executive board of the studied cases.

6.1.1 – Board of Directors

The Danish Company Act does not pose any legislative hindrances to including some level insider presence on the board of directors. Nevertheless, all of the studied cases employ a board of directors dominated by independent directors, and none of the case companies have overlaps between the executive board and the board of directors. This is somewhat of a surprise given that Linck et al (2008) and Lacetera (2001) argue that an independent board’s efficiency decreases with business complexity due the cost of transferring knowledge to outsiders. Therefore, this pattern in board structure is interpreted as if the marginal benefit from insiders is less than the associated risk of increased agency costs. The presence of employee-elected directors in the cases of Genmab, Zealand Pharma and NeuroSearch does, however, resemble the effect insiders. Although, the extent to which this is intentional is questionable since it ultimately is up to the employees to decide if they wish to have representatives on the board.

It is found that all of the studied cases exhibit a preference for board members that have significant technical expertise and experience with the pharmaceutical industry. Genmab, Topotarget, and Zealand Pharma have also been found to make use of committees and/or cross-organizational task forces that facilitate interaction among/between developers and the board of directors. These are believed to be mechanisms that improve the board members’ ability to make informed decision, despite their status as outsiders to the process that generates innovation. Lastly, it is a way to empower the board’s advisory and resource-provision role because such interaction also facilitates the transfer of knowledge from the directors’ to the learning process (Hillman et al, 2008).
Together, the case studies support the principal-agent theory in the importance of ensuring that the board members are capable of fulfilling their duty as guardians of the principals’ interests through monitoring and strategic guidance. In relation to this, it is acknowledged that Linck et al (2008) and Lacetera (2001) might be right that outsiders are less efficient monitors as compared to insiders, ceteris paribus. However, the above measures are argued to help bridge the informational gap between independent board members and the learning process, which empowers objective monitoring that – as posited by Hermalin and Weisbach (2003) – is more efficient.

6.1.2 – Ownership Structure

Common for all of the studied companies is that each of them has at least one blockholding investor owning 10 percent or more. In addition, four in five companies are owned by groups of four or more investors with at least 5 percent equity each. The concentration of the ownership structure is an expected reaction in response to complex business environments as means to increase flexibility of decision-making following unexpected events (Demsetz and Lehn, 1985) – a description that mirrors the nature and needs of firms operating in the biopharmaceutical industry.

This is due to collocation of economic interests and control rights, which favors monitoring and a more active approach to managing investments. In fact, two of the five cases have blockholding venture capitalists, private equity firms, or hedge funds, which are types of investors that are known for their strategy of actively managing investments. This is demonstrated in the case of Zealand Pharma, where a group of venture capitalists according to a former CEO were an active part in setting management targets and the overall strategy.

The ownership structure of the investigated biopharmaceutical firms converges to the expectations of theory, which supports that complex concentrated ownership tend to be favorable under complex business conditions. Therefore, the studies do not provide much new insight on this topic.
6.1.3 – Executive Compensation

All of the studied cases have been found to pay executives a fixed base salary coupled with variable components such as annual cash bonuses and participation in warrant programs that together ensure that agents are rewarded for both short and long-term performance. The choice of warrants as opposed to shares as a means to ensure long-term performance is not too surprising since this type of remuneration reduces risk aversion. Consequently, the executive board has an increased appetite for risk when making investment decisions, which is desirable when facing many but risky growth opportunities. A more practical implication is also that the cost of issuing warrants is less than that of issuing shares or cash bonuses, which is an important factor to consider given that the majority of biopharmaceutical firms starve. A study by Anderson et al (2000) similarly concludes that firms in innovative and high risk industries – in comparison to other industries such as consumer goods – generally are more inclined to award options to employees. The interpretation is that options both act as a means to align incentives as well as encourage talent to commit to innovation in the long-term.

There are no findings that indicate the use of behavior-based performance indicators that Makri et al (2006) promote as a means to encourage certain activities. This is coupled with the fact that the studied business cases mirror the explanation and approach that theory suggests, i.e. align incentives by introducing a combination of short and long-term components that rely on firm performance. Consequently the study does not provide any new insights on this particular topic.

6.2 – Answer to Sub-Question 2: How do biopharmaceutical firms’ corporate governance structures resemble theory on governance of innovation?

Governance of innovation differs from principal-agent theory by focusing on the underlying process of innovation as a central part of the corporate governance of innovative firms. Therefore, in answering this question we look to the case companies’ approaches to encourage commitment of financial, physical, and human resources that together through collective learning become innovation. At first, it might be hard to see the resemblance with the common definition of corporate governance as the system by which business corporations are directed and controlled (Cadbury Committee, 1992).
However, this approach to governance still involves decisions on the division of control and the alignment of incentives among internal and external stakeholders.

The case studies widely support that innovation is an evolutionary process of collective learning that requires long-term commitment to irreversible and uncertain investments. They all highlight the need to encourage long-term commitment from the talented individuals that create innovation as a method to manage developmental risk. The cases encourage such commitment by offering warrants to all employees of the organization. This is consistent with O'Sullivan’s (2000) suggestion that sharing the gains from innovation is one of the most powerful motivators. This conclusion is, however, argued to rely on the assumption that employees can visualize and understand the link between their own effort and overall firm performance since Core et al (2003) find that share-based incentives have limited effect when the opposite is true.

The cases’ approach to risk management indicates that it is important to integrate the different actors and functions across the organization. Specifically, Genmab, Topotarget and Zealand Pharma do this by employing cross-organizational teams and scientific committees. These mechanisms integrate different capabilities, as proposed by Lacetera (2001), while also implicitly leaving control over the allocation of resources in the hands of individuals who are intimate with the learning process.

The importance of decision-makers’ familiarity with the learning process is a general theme of theory on governance of innovation and the case studies mirror this expectation. For instance, the cases’ management teams include executive functions that are inherently related to innovation, e.g. chief scientific officer and director of clinical development. The case firms have similarly been found to prioritize executives with a high level of technical ability.

The cases’ boards of directors give a clear priority to outsiders with significant technical expertise. This is interpreted as an active choice to bring in resources (Hillman et al, 2008) and bridge the gap between strategic decisions and the underlying scientific processes in order to facilitate collective learning and successful innovation (O’Sullivan, 2000).

Lacetera’s (2001) proposal that alliances are an emerging source of collective learning and financial commitment is widely supported by the findings from the case studies. The observed types of alliance
range from research and co-development agreements to out-licensing of intellectual property in exchange for financial, human, and physical resources. Genmab, Topotarget, and Zealand Pharma have integrated out-licensing agreements with big pharmaceutical firms as a central part of the overall strategy to successfully develop and commercialize drugs. Under these agreements the biotech firms grant licensing and control rights to big pharmaceutical companies that are willing to spend significant resources on the novel capabilities inherent in the biotech industry. In this sense big pharmaceutical firms are the natural solution to what O’Sullivan (2000) refers to as financial commitment.

Bavarian Nordic has strategic partnerships with the US government that resemble out-licensing and co-development agreements as they provide a source of collective learning and to a certain extent also financial commitment. NeuroSearch, however, primarily focuses on research agreements under which big pharmaceutical firms make upfront investments in exchange for first option rights to intellectual property. These agreements do not involve a promise of financial commitment nor do they empower collective learning, i.e. NeuroSearch solely is in charge of the research up until an option is exercised.

In conclusion, by relying on theory on governance of innovation as an analytical tool, the case studies have revealed specific mechanisms that facilitate commitment of resources to innovation. The most notable findings are the use of alliances as a source of financing and capabilities, encouragement of commitment through share-based incentive schemes to all employees, and cross-functional task forces as means to reduce development risk.

6.3 – Answer to Sub-Question 3: What are the implications of the findings from questions (1) and (2) for the overall picture of biopharmaceutical firms’ corporate governance?

Figure 15 depicts the relationship between the primary factors that through the case studies and preceding discussions have been identified as the cornerstones in the governance of biopharmaceutical firms. That is, alliances, board of directors, collective learning, executive board, and large investors.
In this model we adopt O’Sullivan’s (2000) notion that collective learning is at the heart of governance of innovation. This decision is based on the wide support and emphasis that the examined cases have been found to lend to traits that integrate resources and encourage commitment to innovation. In relation to this it is, however, also found that O’Sullivan’s (2000) initial concept of governance of innovation perhaps is less suitable for firms that starve cash. This is because the approach implicitly seems to assume that innovation only is a subset of the company’s activities, and in this setting the main concern becomes how to encourage the allocation of internal resources to innovative activity. Conversely, biotech firms are formed for the purpose of creating novel drugs, and therefore they have a natural incentive to invest in innovation, although they often lack the financial resources to do so. Consequently, the objective is still to encourage financial commitment and intellectual commitment (i.e. organizational integration), however, biopharmaceutical firms have been found to expand the allocation problem to include incentivizing the allocation from external actors.

The executive board wields control over allocation decisions that affect collective learning, however, its decisions are shaped by factors that either directly (alliances) or indirectly (alliances, board of directors, large investors) affect the process of collective learning. Alliances have both direct and indirect effect on collective learning because they have the power to shape the executive board’s decisions on resource allocation while also exerting some level of direct control through contractual rights.
6.3.1 – Collective Learning
Collective learning refers to the processes and individuals that in collaboration make up innovation. Theory on governance of innovation posits that it is important to grant insider control to the individuals that own the processes that generate innovation in order to empower collective learning. This involves the allocation of (internal) control rights and integration of organizational members’. Here, there is a clear difference between the better performing group of firms and NeuroSearch. The better performing group emphasizes traits that resemble organizational integration and view collective learning among internal and external stakeholders as an essential part of creating and preserving shareholder value. This can for instance be achieved by establishing cross-functional teams and scientific committees that join together individuals from different levels and functions of the organization. This ensures that knowledge is dispersed, challenged and refined through collective learning. NeuroSearch, on the other hand, provides no information that indicates a similar approach and view upon innovation.

One implication to corporate governance is that the decision-making process becomes influenced by non-executives who nonetheless are central to the learning process. It is arguably also possible that part of the real control will vest with such individuals in order to make the work of scientific committees fruitful. That is, it becomes inefficient if scientists constantly have to communicate with the top-management, and therefore they should be given discretion to make certain decisions. This approach does, however, also raise the need for corporate governance to go beyond the shareholder-manager relationship in terms of limiting agency problems. That is, the dispersion and delegation of control throughout the organization also gives rise to a greater risk of agency problems and associated costs from within the organization. For example, scientists may be prone to promote disease targets that they have an interest and skill within rather than choosing the most promising and profitable drug candidates.

One possible solution is to align incentives of all the employees by allowing them to receive a share of the gain from innovation. At least this is the solution that the case companies have been found to use by offering warrants to all members of the organization is. The official explanation is a desire to encourage long-term commitment from talented individuals (i.e. make relation-specific investments) but it will inarguably also serve to align incentives. Consequently it is suggested that, the use of warrant programmes, or a similar share-based instrument, is an element of good corporate governance.
In conclusion, the case studies support theory on governance of innovation in that more successful biopharmaceutical firms employ mechanisms that facilitate collective learning. However, the study also finds that these mechanisms in some cases can increase the risk of agency costs, which in turn implies that traditional mechanisms that aim to monitor and align incentives still are of great importance.

6.3.2 – Alliances

Lacetera (2001) suggests that alliances are important to collective learning in two ways; they can both be a source financial commitment as well as new technology, knowledge, ideas etc. The case studies support this, although the findings suggest an amendment to the statement. That is, the case studies indicate that the effect of alliances depends on the type of relationship, since strategic partnerships hold the potential to influence the executive board’s decision in both negative and positive ways.

The only dominantly positive type of alliance is out-licensing because they are source of financial, human, and physical resources. That is, they offer financing that allows biotech firms to expand their pipelines and diversify risk. They also assist with study designs, and bring an extensive experience with the commercialization of drugs.

In terms of corporate governance, out-licensing is argued to have a disciplining effect on the biopharmaceutical firm’s management. This is based on the fact the licensee has a combination of economic incentives, a high level of technical knowledge, and access to insider information, which makes a strong candidate for benefiting from monitoring the managers’ behaviour. Moreover, the licensee has incentive to continuously re-estimate the underlying drug’s potential because they face an on-going cost from financing the development and milestone payments. It is also argued that investors can use out-licensing agreements as signal of the quality of innovation. The case of NeuroSearch provides an excellent example of this signal effect; Boehringer Ingelheim decided to forfeit their licensing rights for a drug, which later was continued by NeuroSearch as a standalone project. Here, the licensee sent a strong message that questioned the quality of innovation, which the investors were unlikely to have received had there not been an out-licensing agreement in place.
Essentially, the presence of an out-licensing agreement is argued to serve as a validation of a drug’s commercial potential and the preliminary quality of innovation, whereas the inability to out-license has the opposite interpretation.

Research and co-development agreements are somewhat of a grey area because the effect on corporate governance depends on the type of partner and the specific obligations and rights of the agreement. For instance, they can have potentially adverse effects in terms of shareholder value when involving the sale of first option rights to a partner that does not incur development expenses prior to exercising the option. In this case, the option holder’s payoff structure is the equivalent of a call option, which implies that he or she only faces the upside chance. As a result, the holder has the incentive to endorse the pursuit of projects even though their expected value is below zero because the downside risk largely is borne by the writer of the option. This is supported by the NeuroSearch case; the co-founder and former chairman of the board explains that part of the explanation to the company’s demise rests in a strategy that has been too focused on high risk/high payoff rare disease targets. The company had sold several first option rights to big phamas that either directly or indirectly may have encouraged the choice of this investment strategy.

The case of Bavarian Nordic does, however, provide findings that support that research and co-development agreements can be a source of novel discoveries that can supplement in-house R&D. Here alliances are not a source of traditional corporate governance mechanisms that keep management in check but a valuable addition to the firm’s innovative capabilities. One caveat in relation to this type of agreements is that institutions such as research centers and universities are driven by non-financial motivators such as the betterment of mankind and reputational gains. Therefore, this type of alliance partner is less concerned with the cost of capital, which is at odds with the investors’ incentives because it gives less reason to make cost-benefit considerations. Consequently, control should reside with the for-profit entity to such agreement – as is the case for Bavarian Nordic.

The case studies indicate that the more successful category of firms actively uses alliances as vehicles for collective learning and financial commitment. Genmab, Topotarget, and Zealand Pharma openly state that strategic partnerships are an integral part of the overall strategy. Bavarian Nordic also uses alliances to leverage the company’s propriety development technology by in-licensing novel drug
candidates. NeuroSearch stands out as the only firm in the sample that does not regard alliances as central to the strategy, nor does the firm have any partnerships that focus on collaboration that resemble the benefits of collective learning. These preliminary observations underline the necessity of incentivizing outsiders to allocate resources to the firm’s innovative activities, since failure to do so appears to impede innovative progress.

The case of Zealand Pharma provides an excellent example of how the integration of alliances as part of the overall strategy can benefit governance. That is, the company targets big pharmaceutical firms as the actual customer, and hence chooses disease targets accordingly. This, in turn, reduces the risk of scientists pursuing unprofitable pet projects because the set of possible candidates already has been defined by the big pharma’s preferences.

Based on the preceding discussion of the role of alliances it is argued that especially out-licensing agreements appear to have a predominantly positive. Consequently, it is argued that out-licensing (and certain other types of alliances) has a role in a good system of corporate governance.

6.3.3 – Large Investors
It is important to monitor the executive board in order to mitigate the biotech industry’s otherwise high level of information asymmetry. Therefore, a concentrated ownership structure is valuable to corporate governance of biopharmaceutical firms due to collocation of economic interests and significant control rights that together facilitate and incentivize monitoring and active management of investments.

The case of Zealand Pharma indicates that active investors try to increase the chances of commercial success by bringing in valuable connections and insights to the professionalization of science-driven start-ups. That is, the company is actively managed by a group of venture capitalists that have aided in formulating the business strategy and setting performance targets to the management through their presence on the board of directors. The cases of Bavarian Nordic and NeuroSearch support that concentrated ownership also can serve as a source of financial commitment through rights issues. However, this type of financing appears to be more costly to shareholder value than do debt financing and out-licensing, which in fact is what one should expect according to the pecking order theory on
financing under information asymmetry (Myers and Majluf, 1984). Hence, the case information largely supports existing theory.

6.3.4 – Board of Directors

Based on the case studies, it is found that board composition should prioritize independent members in order to ensure that the directors are uninfluenced by conflicts of interest that can hamper the objectivity of monitoring the management’s decisions. This suggests an amendment relative to the expectations of theory of governance of innovation (Lacetera, 2001) and principal-agent theory (Linck et al, 2008). In relation to this, the case studies indicate that it is important to introduce supporting mechanisms that can link outsiders with the process that generates innovation. This is important for two reasons; first of all, it negates the risk that independent directors fall short in terms of monitoring highly complex decisions inherent in running a biopharmaceutical firm. Secondly, it is important in order for the directors to fulfil their role as strategists, i.e. technical ability goes hand in hand with the ability to shape the learning process in response to threats and opportunities.

The most noticeable findings in relation to mechanisms that achieve this are the act of giving priority to directors with vast technical expertise and including directors on scientific committees. This empowers the board of director’s ability to comprehend and take advantage of the technical details of innovation.

6.3.5 – Executive Board

Theory on governance of innovation assumes a positive correlation between possessing decision-making power and the incentive to take part in the dispersion of knowledge that facilitates collective learning. Another benefit is that it can encourage commitment from talented researchers, which perhaps is equally important because the ability to come up with novel drugs depends on the combined knowledge of the firm’s researchers and scientists. In fact, the presence of star scientists27 has by Darby and Zucker (2007) been shown to be positively correlated with the innovative success of biotech firms.

The above reasons are argued to be part of the reason that all the cases have found it favourable to

---

27 Defined as scientists with at least 40 genetic-sequence discoveries or authorship of at least 20 articles reporting on such discoveries.
prioritize individuals that have extensive technical knowledge and experience. Genmab is a great of example of this as the management team altogether has authored more than 500 scientific papers and obtained in excess of 90 patents. Similarly, the executive boards include roles that are closely related with the underlying innovative process, such as chief scientific officer and director of clinical development.

Similar to the problem arising when delegating control to non-manager scientists, then the delegation of decision-making power to managers that live and breathe science also involves a potential agency problem. That is, the management’s decisions may tend to become influenced by scientific rather than economic aspirations. This strongly supports the earlier argument regarding the importance of ensuring efficient monitoring and incentive alignment. This is backed by case studies since all firms have been found to offer a combination of cash and share-based incentives that align the managers’ wealth with that of shareholders. In addition, as shown, the cases’ choice of members for the board of directors favours the monitoring role.

6.3.6 – Implications for Corporate Governance
As it turns out, all of the studied cases’ systems of corporate governance are identical in terms of mechanisms inspired by principal-agent theory, i.e. board of directors, remuneration policy, and ownership structure. It is argued that this may be an indication that these mechanisms in themselves do not lead to notable differences in firms’ performance. This is, however, not to say that it supports Duncan et al’s (2006) statement that these mechanisms are virtually useless for biotech firms. Instead it is argued that they in fact are an essential foundation for any good system of corporate governance. This suggestion is based on existing literature (Jensen and Meckling, 1976; Lacetera, 2001; Makri et al, 2006) as well as the findings from the case studies. For instance, it has been shown that there is reason to suspect that some of the measures that the cases use to promote innovation may have a downside, i.e. increased risk of agency problems arising between the layers of the organization. Therefore, it is indisputable that these mechanisms must be in place in order to deter opportunistic behaviour and encourage investors (shareholders and alliances) to commit resources.
The case studies do, however, also support theory on governance of innovation in that corporate governance in innovative firms comes down to far more than forming optimal contracts with suppliers, customers, employees, and managers. Specifically, alliances have been shown to be an integrated part of the innovative process in more successful biopharmaceutical firms. These same firms also employ mechanisms that are intended to integrate the organizational members’ different capabilities through cross-functional/organizational teams and scientific committees. In addition, the case studies also indicate that it is important to encourage long-term commitment of human capital to innovation, which commonly is achieved through share-based remuneration to all employees. Consequently, the case studies suggest that biopharmaceutical firms should employ a concept of corporate governance that to a greater extent includes the formation of the strategies, processes and structures that aid innovative investments in reaching their potential.

Based on the above findings, it is in fact argued that the two approaches complement each other in the corporate governance of biopharmaceutical firms; the mechanisms of governance of innovation primarily work to nurture the upside of innovation while the traditional mechanisms contain risks deriving from agency problems. Therefore, the findings from the Danish biopharmaceutical industry indicate that good corporate governance of biopharmaceutical firms involves an expansion of the concept of corporate governance. That is, it consist of elements that emphasize principal-agent theory in order to contain agency costs while offering ways in which innovation can be promoted, as called for by Lacetera (2001).

The case studies’ role in the process towards the above conclusion has been to use existing theory as a tool to analyze the employed governance mechanisms in the biopharmaceutical industry. Therefore, it should not be viewed as an attempt to validate either of the two schools of theory but rather as guideline that suggests a set of elements that appear to contribute to good corporate governance.
6.4 – Answer to Sub-Question 4: What are the preliminary recommendations and/or topics of further research based on the findings in question (3)?

This section offers preliminary recommendations for good corporate governance that focus on supplementing the traditional corporate governance mechanism in forming a good system of corporate governance of biopharmaceutical firms. This is based on the fact that the case studies have made limited to no novel discoveries on the traditional mechanisms, which in turn also indicates that these mechanisms already are widely employed in the governance of biopharmaceutical firms.

6.4.1 – Preliminary Recommendations

The first recommendation is that biopharmaceutical firms establish cross-functional teams and scientific committees that join together individuals from different levels and functions of the organization. This recommendation serves to facilitate monitoring and the integration of complementary capabilities in an effort to empower collective learning, and thus also probability of successful innovation. It is supported by the findings from the cases of Genmab, Topotarget, and Zealand Pharma.

The second recommendation is that biopharmaceutical firms should offer warrants, or similar share-based incentives, for all members of the organization. This recommendation serves to align incentives and create long-term commitment from talent. It is supported by findings from all of the cases.

The third recommendation for biopharmaceutical firms is that they actively integrate alliances, and particularly out-licensing, as a central part of the strategy. In more practical terms, this recommendation involves the employment of executive(s) whose designated duty is to build and maintain alliances as well as a strategy that actively targets the preferences of big pharmaceutical firms. It is based on findings from the cases of Genmab, Topotarget, Zealand Pharma, and Bavarian Nordic.

The fourth recommendation is that biopharmaceutical firms implement internal control systems that not only oversee but also evaluate and guide the scientific decisions of the employees that are central to innovation. This recommendation facilitates both collective learning and monitoring, which in turn is argued to negate the impression of being scrutinized. This is based on findings from Zealand Pharma.
and Topotarget that both employ advisory boards seated by external experts whose primary duty is to evaluate and guide decisions related to the scientific processes of drug development.

**6.4.2 – Further Research**

The case studies are intended to formulate hypotheses or preliminary recommendations that eventually can become actionable mechanisms. In order to arrive at this stage, it is necessary to conduct further research that serves to verify and elaborate on the identified preliminary recommendations to good corporate governance of biopharmaceutical firms.

Specific topics of interest include how exactly cross-functional teams and scientific committees interact and function in a manner that facilitates collective learning, which can lead to more a specific recommendation. In relation to this, the extent to which insiders from the learning process in practice are granted real and/or formal control over decisions that affect the allocation of resources is important knowledge that can support the development of internal control mechanisms. Ideally, this should be accomplished through field studies, either in the firms sampled for this study and/or in groups of firms that represent both ends of the spectrum in terms of ability to capitalize on innovation.

Given alliances’ argued positive impact – which is believed to be particularly promising – on innovation and corporate governance, it is meaningful to dive deeper into the specifics of these external relationships. Particularly, it is of interest to register how real and formal control and returns are divided among participants, since this has been shown to be crucial to alliances’ actual impact on corporate governance.

In terms of verifying the preliminary recommendations’ impact on performance it is suggested that effort should be channel into collecting data on biopharmaceutical firms that can be used to run econometric models. One of the main challenges is identifying a measure of performance, which is something this study potentially also suffers from. That is, it uncertain to what extent pipeline width and depth in fact does mirror innovative capability. Therefore, it is advised that several models with various dependent variables are estimated. Examples are share performance, percentage of drugs progressing from pre-clinical to phase II/III, frequency of citation in scientific journals, and of course
this study’s pipeline width/depth measure. The explanatory variables should include, but not be limited to, the recommended mechanisms that make up a good system of corporate governance in biopharmaceutical firms. That is, a set of dummy variables that represent alliances, cross-functional integration, the use of share-based incentives for all employees, and internal control systems of scientific decisions.

It is, however, acknowledged that that there possible is issue of endogeneity between performance and the presence of alliances – That is, firms that are more innovative are better at securing alliance partners, which implies a loop of causality.
Chapter 7 – Conclusion

This study’s aim is to investigate elements that make up a good system of corporate governance of biopharmaceutical firms. It is, however, acknowledged that the findings only are tentative hypotheses and not solid evidence due to the nature of case study research.

With a vantage point in traditional corporate governance mechanisms (executive compensation, the board of directors, and monitoring) and theory on governance of innovation, the corporate governance systems in a sample of Danish biopharmaceutical firms are mapped.

A cross-case comparison of the findings reveals that the sampled firms employ a mixture of mechanisms that resemble the solutions offered by both principal-agent theory and theory on governance of innovation. In line with O’Sullivan’s (2000) concept of governance, the use of mechanisms that empower collective learning have been found to be central to successful innovation. Specifically, more successful biopharmaceutical firms disperse, challenge, and refine knowledge through a collective learning process that is empowered by facilitating interaction among actors that have complementary objectives and capabilities. In order for such interaction to be fruitful, decision-making power is delegated to individuals that are insiders to the process that generates innovation (i.e. scientists and researchers). More successful firms also actively work towards forming alliances with big pharmaceutical firms and centers of scientific excellence that provide financial and intellectual commitment in exchange for control rights and/or economic rents. However, mechanisms that focus on the principal-agent relationship between managers and owners are also prevalent in the form of share-based remuneration, a composition of the board of directors that favors monitoring and strategic guidance, and concentrated ownership structures. There has not been found any differences between successful and unsuccessful firms in terms of their use of traditional mechanisms but this does not mean that they are not important. In fact, they are argued to be the foundation any system of corporate governance.
The two approaches are in fact argued to complement each other in forming a good system of corporate governance; the mechanisms of governance of innovation primarily support innovative investments in reaching their potential while the traditional mechanisms’ limit agency costs. This implies an expansion of the concept of corporate governance to one that employs existing mechanisms as a foundation while supporting mechanisms offer ways in which innovation can be promoted, as called for by Lacetera (2001).

Consequently, the formulated recommendations of elements that make up a good system of corporate governance of biopharmaceutical firms focus on supplementing traditional mechanisms.

The recommendations are

1. Biopharmaceutical firms should establish cross-functional teams and scientific committees, which join together individuals from different levels and functions of the organization.

2. Biopharmaceutical firms should offer warrants, or similar share-based incentives, for all members of the organization.

3. Biopharmaceutical firms should actively integrate alliances, and particularly out-licensing, as a central part of the strategy.

4. Biopharmaceutical firms should implement internal control systems that not only oversee but also evaluate and guide the scientific decisions of the employees that are central to innovation.

These preliminary recommendations lead to suggestions for topics of further research that aim at elaborating and verifying the findings. Specifically, it is proposed that alliances and the de facto delegation of real/formal control to insiders from the learning process should be investigated further through conducting field studies and econometric analyses.

The combination of initial recommendations and follow-up topics of research are regarded as a significant step towards identifying some of the elements that make up a good system of corporate governance of biopharmaceutical firms – of which alliances are believed to be particularly promising.
Bibliography

In Print


WorldWideWeb

Bavarian Nordic Corporate Website
Link: www.Bavarin-Nordic.com

Link: www.business.dk/investor/neurosearch-partner-stopper-ns2330-til-alzheimers


Link:borsen.dk/nyheder/investor/artikel/1/150016/neurosearch_udvider_aftale_med_glaxosmithkline.html

Link: borsen.dk/nyheder/investor/artikel/13/151327/neurosearch_i_stor_alliance_med_eli_lilly.html

Link: borsen.dk/nyheder/investor/artikel/1/203191/bavarian_nordic_slagtet_paa_trist_aktiedag.html

Børsen (June 27th 2012). “Topchef Forlader NeuroSearch”, Børsen Karriere,
Link: borsen.dk/nyheder/karriere/artikel/1/236057/topchef_forlader_neurosearch.html

Børsen (December 3rd 2012). “Jyske Bank Opgiver NeuroSearch”, Børsen Investor,
http://borsen.dk/nyheder/investor/artikel/1/247136/jyske_bank_opgiver_neurosearch.html

California Biomedical Research Association
Link: www.ca-biomed.org

Link: www.ecgi.org/codes/documents/cadbury.pdf


Committee on Corporate Governance in Denmark
Link: www.corporategovernance.dk

The Danish Company Act
Link: www.retsinformation.dk/Forms/r0710.aspx?id=135933
Dansk Biotek  
Link: www.DanskBiotek.dk

Link: ssrn.com/abstract=1001112

EuroInvestor  
Link: www.EuroInvestor.dk

Genmab Corporate Website  
Link: www.genmab.com

Link: epn.dk/brancher/medicin/article4824585.ece

Link: m.epn.dk/brancher/medicin/article4824924.ece

Link: www.mckinseyquarterly.com/Why_some_private_equity_firms_do_better_than_others_1572

HealthCap Venture Capital AB  
Link: www.healthcap.se

Link: online.wsj.com/article/SB10001424052970203897404578077882348809420.html

Link: www.business.dk/medico/stor-usikkerhed-om-topotarget-fremtid

Link: borsen.dk/nyheder/investor/artikel/1/121596/zealand-direktør_forstaar_ikke_sin_fyring.html

Link: www.business.dk/navne/overgangsfigur-eller-redningsmand

Medicon Valley  
Link: www.mediconvalley.com

NeuroSearch Corporate Website  
Link: www.NeuroSearch.com
Link: borsen.dk/nyheder/investor/artikel/1/231643/joergen_lindegaard_jager_skraemte_investorer.html

Orbis Bureau van Dijk
Link: Orbis.BvDinfo.com

Link: politiken.dk/erhverv/ECE1219069/asger-aamund-skyder-flere-penge-i-bavarian/

Link: www.business.dk/medico/op-og-nedture-er-the-nature-of-biotech

Link: www.business.dk/medico/lisa-drakeman-forlader-genmab

Topotarget Corporate Website
Link: www.Topotarget.com

TV2 Finans (2010). “Bavarian Splitter Forretningen I To For At Vokse”, TV2 Finans Online

Link: borsen.dk/nyheder/investor/artikel/1/206350/joergen_lindegaard_paa_plads_i_zealand_pharma.html

Link: www.business.dk/brancher/genmab-viser-vej-for-biotekbranchen

Yahoo! Finance
Link: finance.yahoo.com

Zealand Pharma Corporate Website
Link: www.ZealandPharma.com
## Appendix A – Schematic Cross-Case Comparison

### Exhibit 1 – Alliances

<table>
<thead>
<tr>
<th>Genmab</th>
<th>Topotarget</th>
<th>Zealand Pharma</th>
<th>Bavarian Nordic</th>
<th>NeuroSearch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out-licensing is an integral part of the overall strategy</td>
<td>Out-licensing is an integral part of the overall strategy</td>
<td>Out-licensing is an integral part of the overall strategy</td>
<td>Primarily used to supplement in-house R&amp;D</td>
<td>Partnerships are not central to the strategy</td>
</tr>
<tr>
<td>Source of financial commitment</td>
<td>Source of financial commitment</td>
<td>Source of financial commitment</td>
<td>Less emphasis on financial commitment</td>
<td>Research agreements are a way to facilitate future out-licensing</td>
</tr>
<tr>
<td>Source of collective learning</td>
<td>Source of collective learning</td>
<td>Source of collective learning</td>
<td>Source of collective learning</td>
<td>Not a source of collective learning</td>
</tr>
</tbody>
</table>

### Exhibit 2 – Composition of the Board of Directors

<table>
<thead>
<tr>
<th>Genmab</th>
<th>Topotarget</th>
<th>Zealand Pharma</th>
<th>Bavarian Nordic</th>
<th>NeuroSearch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Majority of directors are independent</td>
<td>Majority of directors are independent</td>
<td>Majority of directors are independent</td>
<td>Majority of directors are independent</td>
<td>Majority of directors are independent</td>
</tr>
<tr>
<td>No overlap with the executive board</td>
<td>No overlap with the executive board</td>
<td>No overlap with the executive board</td>
<td>No overlap with the executive board</td>
<td>No overlap with the executive board</td>
</tr>
<tr>
<td>Knowledge of the technical aspects of drug development is dominant among the directors</td>
<td>Knowledge of the technical aspects of drug development is dominant among the directors</td>
<td>Knowledge of the technical aspects of drug development is dominant among the directors</td>
<td>Knowledge of the technical aspects of drug development is dominant among the directors</td>
<td>Knowledge of the technical aspects of drug development is dominant among the directors</td>
</tr>
<tr>
<td>Has employee representatives</td>
<td>Has employee representatives</td>
<td>Has employee representatives</td>
<td>Has employee representatives</td>
<td>Has employee representatives</td>
</tr>
</tbody>
</table>
### Exhibit 3 – Composition of the Executive Board

<table>
<thead>
<tr>
<th>Company</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genmab</td>
<td>• Dominated by individuals with high technical capacity</td>
</tr>
<tr>
<td></td>
<td>• Clear link between the learning process and decision-makers</td>
</tr>
<tr>
<td></td>
<td>• The value of strategic partnerships is emphasized by the presence of a VP in charge of Business Development &amp; Alliances</td>
</tr>
<tr>
<td>Topotarget</td>
<td>• Dominated by individuals with high technical capacity</td>
</tr>
<tr>
<td></td>
<td>• Clear link between the learning process and decision-makers</td>
</tr>
<tr>
<td></td>
<td>• The Scientific Director has significant experience with strategic partnerships</td>
</tr>
<tr>
<td>Zealand Pharma</td>
<td>• Dominated by individuals with high technical capacity</td>
</tr>
<tr>
<td></td>
<td>• Clear link between the learning process and decision-makers</td>
</tr>
<tr>
<td>Bavarian Nordic</td>
<td>• Dominated by individuals with high technical capacity</td>
</tr>
<tr>
<td></td>
<td>• Clear link between the learning process and decision-makers</td>
</tr>
<tr>
<td>NeuroSearch</td>
<td>• Dominated by individuals with high technical capacity</td>
</tr>
<tr>
<td></td>
<td>• Clear link between the learning process and decision-makers</td>
</tr>
</tbody>
</table>

### Exhibit 4 – Executive Compensation

<table>
<thead>
<tr>
<th>Company</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genmab</td>
<td>• Focus on aligning short- and long-term incentives through a combination of annual cash bonuses and warrant programs</td>
</tr>
<tr>
<td></td>
<td>• No behavior-based performance indicators</td>
</tr>
<tr>
<td>Topotarget</td>
<td>• Focus on aligning short- and long-term incentives through a combination of annual cash bonuses and warrant programs</td>
</tr>
<tr>
<td></td>
<td>• No behavior-based performance indicators</td>
</tr>
<tr>
<td>Zealand Pharma</td>
<td>• Focus on aligning short- and long-term incentives through a combination of annual cash bonuses and warrant programs</td>
</tr>
<tr>
<td></td>
<td>• No behavior-based performance indicators</td>
</tr>
<tr>
<td>Bavarian Nordic</td>
<td>• Focus on aligning short- and long-term incentives through a combination of annual cash bonuses and warrant programs</td>
</tr>
<tr>
<td></td>
<td>• No behavior-based performance indicators</td>
</tr>
<tr>
<td>NeuroSearch</td>
<td>• Focus on aligning short- and long-term incentives through a combination of annual cash bonuses and warrant programs</td>
</tr>
<tr>
<td></td>
<td>• No behavior-based performance indicators</td>
</tr>
</tbody>
</table>
**Exhibit 5 – Ownership Structure**

<table>
<thead>
<tr>
<th>Company</th>
<th>Ownership Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genmab</td>
<td>Concentrated ownership with four investors owning 40 percent of equity</td>
</tr>
<tr>
<td></td>
<td>Blockholders have not been used as a source of capital post-IPO</td>
</tr>
<tr>
<td>Topotarget</td>
<td>One investor holds a block of 13 percent of equity. Remaining ownership is dispersed</td>
</tr>
<tr>
<td>Zealand Pharma</td>
<td>Concentrated ownership with six investors owning 73 percent of equity</td>
</tr>
<tr>
<td></td>
<td>Activist investors</td>
</tr>
<tr>
<td>Bavarian Nordic</td>
<td>Concentrated ownership with four investors owning 30 percent of equity</td>
</tr>
<tr>
<td></td>
<td>Blockholders have several times supplied capital through right issues</td>
</tr>
<tr>
<td>NeuroSearch</td>
<td>Concentrated ownership with four investors owning 30 percent of equity</td>
</tr>
<tr>
<td></td>
<td>Activist investors</td>
</tr>
<tr>
<td></td>
<td>Blockholders have several times supplied capital through right issues</td>
</tr>
</tbody>
</table>

**Exhibit 6 – Product Portfolio**

<table>
<thead>
<tr>
<th>Company</th>
<th>Product Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genmab</td>
<td>Broad pipeline</td>
</tr>
<tr>
<td></td>
<td>Sustained ability to come up with new promising drug candidates</td>
</tr>
<tr>
<td>Topotarget</td>
<td>Small pipeline</td>
</tr>
<tr>
<td></td>
<td>Has previously successfully developed and commercialized a drug</td>
</tr>
<tr>
<td>Zealand Pharma</td>
<td>Broad pipeline</td>
</tr>
<tr>
<td></td>
<td>Development programmes are designed to target big phamas</td>
</tr>
<tr>
<td>Bavarian Nordic</td>
<td>Broad Pipeline</td>
</tr>
<tr>
<td></td>
<td>Replenished via research agreements</td>
</tr>
<tr>
<td>NeuroSearch</td>
<td>Small Pipeline</td>
</tr>
<tr>
<td></td>
<td>Has started many projects but few make it to the late clinical stages</td>
</tr>
</tbody>
</table>
## Exhibit 7 – Risk Management

<table>
<thead>
<tr>
<th>Company</th>
<th>Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genmab</td>
<td>- Emphasis on traits that integrate the members of the organization</td>
</tr>
<tr>
<td></td>
<td>- Collective learning among internal as well as external stakeholders is</td>
</tr>
<tr>
<td></td>
<td>an essential part of risk management</td>
</tr>
<tr>
<td></td>
<td>- Economic incentives are considered important for securing the employees'</td>
</tr>
<tr>
<td></td>
<td>commitment.</td>
</tr>
<tr>
<td>Topotarget</td>
<td>- Out-licensing agreements are used to reduce financial risk</td>
</tr>
<tr>
<td></td>
<td>- Emphasis on traits that integrate the members of the organization</td>
</tr>
<tr>
<td></td>
<td>- Collective learning among internal and external stakeholders is an</td>
</tr>
<tr>
<td></td>
<td>essential part of risk management</td>
</tr>
<tr>
<td></td>
<td>- Economic incentives are considered important for securing the employees'</td>
</tr>
<tr>
<td></td>
<td>commitment.</td>
</tr>
<tr>
<td>Zealand Pharma</td>
<td>- Emphasis on traits that integrate the members of the organization</td>
</tr>
<tr>
<td></td>
<td>- Collective learning among internal and external stakeholders is an</td>
</tr>
<tr>
<td></td>
<td>essential part of risk management</td>
</tr>
<tr>
<td>Bavarian Nordic</td>
<td>- Economic incentives are considered important for securing the employees'</td>
</tr>
<tr>
<td></td>
<td>commitment</td>
</tr>
<tr>
<td>NeuroSearch</td>
<td>- Economic incentives are considered important for securing the employees'</td>
</tr>
<tr>
<td></td>
<td>commitment</td>
</tr>
<tr>
<td></td>
<td>- No other information is available on specific ways that risk factors are</td>
</tr>
<tr>
<td></td>
<td>mitigated</td>
</tr>
<tr>
<td>Bavarian Nordic</td>
<td>- Economic incentives are considered important for securing the employees'</td>
</tr>
<tr>
<td>NeuroSearch</td>
<td>- Economic incentives are considered important for securing the employees'</td>
</tr>
<tr>
<td></td>
<td>commitment</td>
</tr>
<tr>
<td></td>
<td>- No other information is available on specific ways that risk factors are</td>
</tr>
<tr>
<td></td>
<td>mitigated</td>
</tr>
</tbody>
</table>