Institute for Technology Management

University of St.Gallen

Melanie Schreiner, Fritz Fahrni

Partnering for Success

Creating Win-Win Constellations for long-term Industry-Academia Collaboration

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1. Executive Summary

In the US private funding and grants to universities are very common and a major funding source for universities. During the last years interaction between academia and industry have become a major topic in Europe as well. These collaborations take a variety of forms including the sponsorship of endowed chairs, long-term research contracts, university spin-offs, joint research laboratories, the establishment of science-parks in university environments as well as more problem orientated applied research. Intensifying and stimulating such collaborations is a major concern of involved institutions and politics. Incentives and motivation differ from the point of view. The success factors for collaboration between academia and private industry have to be considered carefully to make them as fertile as possible.

From the academia's point of view, partnerships with industry effectively provide them with needed funding sources as government support for university research declines. The consolidation of national budgets all over Europe during the 90s left the research budgets not unaffected. In best cases they remained stable, in some countries they declined in terms of absolute amounts. Universities are forced to secure other sources of funding. By pursuing closer industry relations they are confronted with a dilemma as university and industry interests have to be balanced. Differences in approach and culture further complicate the task. On the other hand side such partnership may become a potential conduit for learning and change.

Private industry is increasingly willing to engage in university environments since access to scientific research results and absorption of external knowledge is becoming critical for their success. Global markets, highly demanding customers and strong competition encouraged competition based on innovation. Therefore companies are continuously in search for the latest developments in science, technology, methodology and innovative brains. Universities are, by definition, sources for those. Closer relations to academia are perceived as one possibility to survive and stay ahead in a tight competitive context. This also implies that mere sponsoring is in decline and real partnership and joint work become more important. Materialisation of investment is requested.

Considering national systems of innovation politicians are concerned with technology transfer. Government's investments in research and development within universities have to be justified by a satisfying technology transfer. Not only outstanding reputation within the worldwide scientific research community is appreciated. Emphasise is shifting to a successful transfer in the countries' industry environment to enhance competitive advantage of the companies and thereby spur economic growth and social well-being. Income measures like expenses for research and development are completed by outcome measures of applications.

Possibilities and opportunities to establish winning industry-academia collaborations for the benefit of all participants are high. Companies get access to unique expertise, facilities, latest technologies and attractive skill not reproducible in an industrial setting. Company R&D is leveraged through outside knowledge, serendipity can be increased and potential employees are attracted. Universities can quantitatively and qualitatively enlarge their research portfolio. They are provided with input from practice securing relevance of research topics. Results can be used for educational purposes delivering the latest methodologies and technologies to (PhD) students. Last but not least technology transfer is increased giving additional meaning and purpose to their work.

Each partner has to:
- clearly define its own goals and positions.
- evaluate the existence of complementary positions.
- develop a shared vision and align strategic goals.
- be willing to truly accept differences where needed and appropriate.

However, willingness, opportunities and perceived need are not sufficient conditions. First, both partners need special competencies valuable to the other party. This represents a precondition for every academia-industry collaboration intending to deliver valuable results for the participants. It defines the vision and common objectives from the partnership.

- Support and demand personal competence, eagerness and initiative.
- Create an innovative culture and motivating organisational set-ups.
- Promote and sustain learning of all parties and participants.

Second, such collaborations demand long-term commitment and accountability of both partners. They aim to push forward scientific knowledge for the benefit of researchers and business rather than well-defined problem solving.

- Research culture and approach must allow for long-term commitment from all sites.
- Implement efficient monitoring and review processes not killing motivation and causing an administrative bulk.
- Buffer exogenous shocks that might occur during the collaboration.

Third, personal engagement and eagerness are as critical as personal contacts for initiating and operating collaboration. A business attitude and entrepreneurial spirit at personal and institutional level facilitate the aim of university researchers to carry out joint work with company researchers. In addition motivating structures and incentive systems encourage such engagement. To use the full potential of joint working, willingness to learn from and with each other is essential.

- Search for and establish suitable opportunities for exchange and interaction.
- Initiate personal linkages and networks, foster communication.
- Prepare “academic” and “industrial” for windows of opportunity.
- Use environmental monitoring to detect favourable circumstances.

Fourth, times are not always suited for initiating collaborations. Environmental monitoring to gather relevant information is a prerequisite to be able to detect possibilities. In addition, close relations do not develop from one day to another. Foregoing, considerable effort has to be dedicated to the development of a common language and mutual understanding. A solid basis is needed to overcome the barriers and dilemmas, which are embedded in the different self-understanding, and operating environments of universities and private industry. Therefore, mechanisms, which help to develop mutual understanding and a common language, are important. They provide possibilities to establish personal contacts, which in turn facilitate the set up of closer relations of the organisations in which the people act. They ensure that the grounds are prepared when opportunities for joint action occur.

- Develop support for partnerships in the academic and institutional culture.
- Communicate partnership agreements on time and open.
- Be aware of public opinion and political concerns.

Fifth, the success of attempts to establish long-term collaborations are highly depended on a suitable context and well communicated appropriate intentions of both partners. Cultural environment and political considerations must be taken into account.

- Provide good, reasonable (not excessive) “political infrastructure”.
- Provide clear rules how to handle Intellectual Property Rights.
- Minimize administrative procedures and delays.

Finally, external factors always play a role in location decisions but they turned out to be less decisive than expected and reported in the media. The “soft facts” described in foregoing points seem to be far more important. In the end the quality of the partners is the crucial criterion.

Long-term collaborations between universities and private companies seem to be at a turning point. Changed conditions and intentions shifted emphasise from one-way sponsorship relations to manifold partnership relations. This challenges universities, companies and politicians.

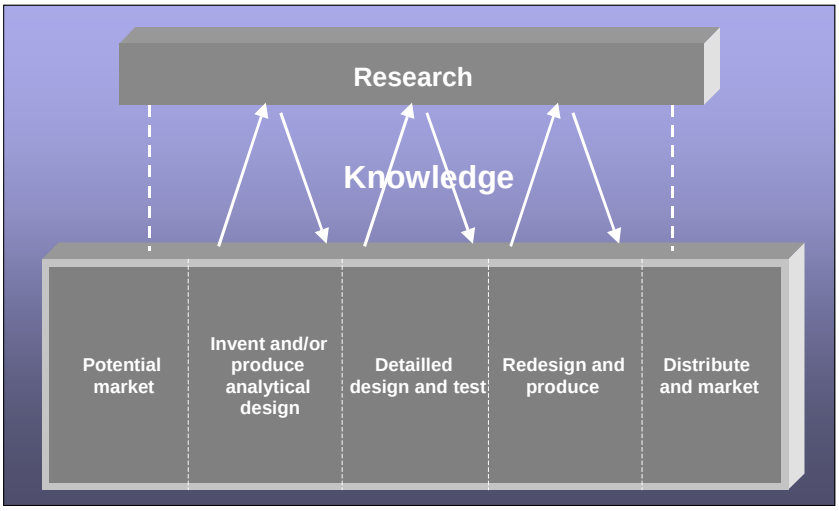
2. Roles and Linkages in Innovation Systems

2.1. Innovation in the Knowledge-based Economy

Innovation is a key driver for long-term economic growth, social well-being and the primary basis for competitive advantage in world markets. They are arising from the effective exploitation of new scientific and technological knowledge. The current wave of scientific discoveries and technical advances, therefore, presents a broad basis for future prospects.

The processes leading to innovation are undergoing profound changes. Since the times of Francis Bacon the creation of innovation has been seen as a linear process consisting of different phases mainly independent from one another. In the first place curiosity-driven basic research provides new scientific discoveries in the different areas. Thereafter, applied research figures out what practical problems can be addressed based on the new knowledge. Consequentially, technology development takes place. Product development consisting of design, engineering and prototyping offers actual solutions to real problems. Each phase is completed before the next one starts. Within the process exist no feedback- or forwards loops. A successful innovation is the outcome if the market in particular the customers accept that solution and are willing to pay an appropriate price.

Figure 1: Chain-linked Model of Innovation



Source: Kline/ Rosenberg (1986).

In recent decades this basic technology-push approach to innovation is complemented with demand-pull approaches. They emphasise that successful innovations are developed through creative management of knowledge in response to market-articulated demands and other social needs. The exploitation of scientific and technological forthcomings well away from a practical application has to be linked with customer needs and demands. Since the driving forces and the conditioning frames of basic research and applied research and development are different the establishment of effective linkages is not an easy business. However the approaches represent two sides of a medal leading to a more integrative perspective of the innovation process. The sequential phase model is more and more abandoned. Innovation processes are far more complex and often proceed with different process loops as modelled by Kline and Rosenberg in their well-known innovation scheme (see figure 1).

The driving forces behind the changes in innovation processes can be identified within two categories:

- Increasing market pressure stemming from globalisation, deregulation, changing patterns of demand and new social needs and
- Scientific and technological developments like diminishing cost of access to information and it's processing or increasing multidisciplinarity in the production of new knowledge.

Formerly well performing competitive strategies like imitation or barriers to entry do not hold anymore. Since competitive advantage through outstanding innovation performance

is seen as the most promising strategy, a closer integration of technology in commercial strategies is pursued. The production of goods and services is becoming more science-intensive through better use of existing scientific knowledge, and more technology-intensive through diffusion of advanced equipment. In addition, advanced skills are required since the management of the increasingly complex productive activity gets more and more demanding. Besides technological capabilities, organisational and managerial skills are needed.

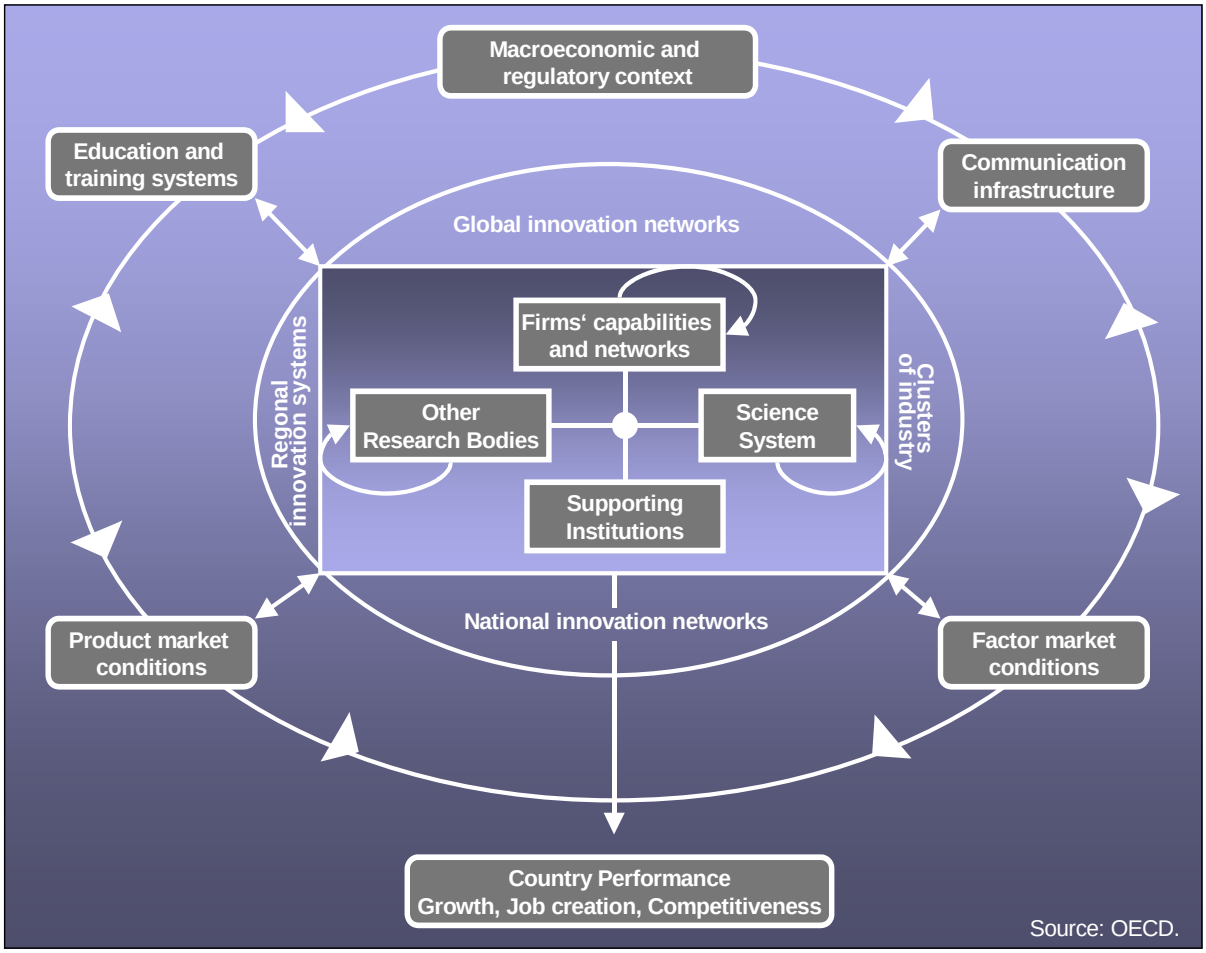
The whole process of innovation is carried out by different actors in their specific legal, scientific, institutional and social context, which is shaped by national conditions predominant in different countries. This environment determines the concrete innovative activities, which can differ to a large extend even if different countries deal with the same technology. A systemic approach based on new growth theory, evolutionary, industrial and institutional economics led to the concept of national innovation systems. This framework provides the basis for the analysis of complex innovation processes at a micro, meso as well as macro level.

2.2. National Innovation Systems

As defined by *Metcalfe* national innovation systems are a "…set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provide the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts which define new technologies".

As described in chapter 2.1 the production of scientific knowledge and its transformation into innovation undergoes a major transformation. Emphasise is shifting towards cutting across disciplines, institutions and countries. Universities and specialised research bodies are no longer the sole institutions concerned with advancements in science and technology. Further, scientific knowledge creation is increasingly conducted with an eye to its application and involves a widening range of institutions. The overall performance depends not only on the performance of individual actors within the system. Quantity and even more quality of interactions between the different entities of the systems of innovation are of equal importance.

Figure 2: Actors and Linkages in Innovation Systems



Different actors within the system carry out knowledge generation, diffusion and use. Major entities are firms, the science system consisting of universities, public research institutions and other research bodies and supporting institutions. All of them are crucial elements since the overall success in performing these tasks is dependent on all of them. Entrepreneurs and firms in a Schumpeterian sense are vital. Their motivation to take risk and capitalise on technology development and innovation secures economic growth and development. But there has to be a scientific fundament. Private investment on building up that fundament through knowledge creation is discouraged by too high a risk and uncertainty. Public engagement is needed. This is justified because in the long run social returns on research outperform the private return. The consequence is an institutional separation of creation and use of knowledge. This has ever been a disadvantage for the whole system but the reconnection has never been that crucial as today. These circumstances are increasingly perceived on an individual and organisational/institutional level. In the last decades, different tasks and separated evolution of science and corporate sphere has erected barriers between them. This comes in terms of different approaches, structures, processes, cultures and a missing mutual understanding. Thus, involved people and organisations in the inner circle of the innovation system are engaged in transforming attitude and context to ease collaboration. Successful innovation depends to a greater extend than ever on effective mechanisms of transfer between the several entities.

The capacity of an innovation system is not only determined by the scientific capabilities but also by global conditions like factor and product market conditions, the education and training system, communication infrastructure and the macroeconomic and regulatory context. Some of them are strongly shaped and influenced by the business sector and the science system. With respect to encouraging interaction and facilitating technology and knowledge transfer between the two policy approaches of legal authorities plays a critical

role. Since direct control cannot be executed (and would merely lead to success) influence through legal regulation, funding policies and procedures is important. Further, active shaping of common opinion towards collaboration between different actors influences the outcome. Both approaches – by hard and soft facts – are essential to direct interaction as desirable.

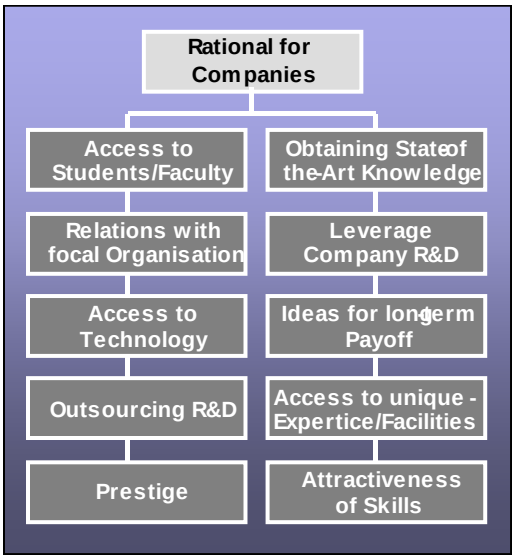
In summarise, one can state that interaction and collaboration between different actors in the system is to be fostered. This is perceived not only from a theoretical point of view. Approaches to realise this in practice have to consider the individual, the organisational and the policy level. Initiatives have to address hard and soft facts.

2.3. Roles of Private Industry

Private companies are key players in the innovation process. They conduct the majority of research and development in most countries all over the world (see table 1). The focus of their activity lies in applied research and product development although especially the big companies conduct some basic research as well. Recent developments in the R&D activities of private firms are characterised by an increased globalisation and financial consolidation.

In general, firms innovate when they are motivated to do so and can afford the required investment. Both conditions are highly influenced by the business environment. This includes favourable conditions like competitive markets forcing firms to be innovative to survive competition and take risk in order to do so. Factors that discourage innovation in general (high interest rates, inflation, and volatility of exchange rates etc.) have negative effects on innovation and technology diffusion. The attractiveness of innovation strategies is further reduced by (1) a financial sector unable to assess innovative projects, (2) weak approbiability regimes, which reduce the rewards for creativity and (3) regulations, which increase risk and costs of commercialisation of innovative products or processes.

Figure 3: Rational for Collaboration with Universities



Globalisation spurred competition in the international marketplace. More firms than ever before base their competitive strategy on successful innovation to catch up to or forge ahead of competitors. Therefore, a multitude of capabilities and competencies is needed. They consist of knowledge, governance and managerial competencies, comprehensive understanding of product and manufacturing technology, market research, legal aspects, financial planning, accounting, contracting and networking as well as a supportive business environment. This contributes to the fact that innovation needs more than effective R&D.

A prerequisite for innovation is access to new knowledge and absorptive capabilities to internalise and build on it. Although this has ever been an important factor for innovative activities, within the emerging knowledge based economy the importance of these factors and the productivity of knowledge increases.

Companies inevitably have to concentrate on specific areas since the volume, the development pace and the complexity of knowledge accelerate in many relevant technological areas. As a result, they restructure themselves to concentrate on their core competencies and achieve business excellence within those specific fields. However, the sources of innovation even in narrowly defined fields span today around the globe. Firms are the central actors but they do not act alone. The creative and interactive innovation process as described in the beginning of this chapter involves a multitude of institutions as sources of relevant knowledge. The innovative capabilities of companies are determined by their own in-house capabilities but as well by their capability to adopt and apply knowledge produced

elsewhere. Companies exchange information and engage in mutual learning with customers, suppliers, subcontractors and even competitors to develop collaborative capabilities that help to build up and nurture in-house capabilities and improve absorption capacity for external knowledge. Networking and interaction between organisations involved in the innovation process intensify in order to reduce complexity, risk and costs of innovation. The scientific content of innovation is increasing. The scientific roots of innovation become more diversified and change in relative importance. Thus, co-operation between the science system and the business sector is becoming more and more important especially when considering that many firms have reduced their costly basic research in their efforts of financial consolidation of R&D. Incentives to collaborate with universities are given by these conditions.

2.4. Role of Universities

Universities and other higher education institutes are key elements in the science systems and from a countries' perspective in the national innovation systems.

The classical European University was based on the concept of research-based teaching and a comprehensive humanistic education. That was given an institutional form by the founding of the University of Berlin by Wilhelm von Humboldt in 1810. With the Scientific Revolution in the late nineteenth and early twentieth century research was introduced to the universities. Besides their functions as cultural heritage and transmitter of knowledge they were transformed to producers of knowledge. The problematic relationship between research and productive sectors of the economy evolved with the parallel Industrial Revolution. Within the system as a whole a functional and disciplinary specialisation emerged. University focused on basic research – knowledge was sought without considering its practical application and consequences. The internal structure was defined along scientific disciplines rather than problem areas or industrial and societal needs. The freedom of academia to pursue their inquiries and to disseminate their findings has been central to the self-understanding of the institution. The demands for advanced knowledge made on scientific research for reasons of national defence and the growing needs of industry and other branches increased after World War II. Nevertheless, the classical university retains its power until the last decades. In recent times the research and the education related mission of the university has been affected by significant changes in the university environment.

- Government R&D finance has declined: The national households of many countries have been under severe pressure in the 90s. Therefore, government research and development budgets were reduced leading to a levelling of or even decline in university research support. Not effective yet but visible is the decline of R&D budgets given by the European Union. With the upcoming eastern enlargement there is considerable doubt if the large budgets of the Research Framework Programmes are maintained in the future.
- The nature of government finance has changed: Public research funding is increasingly depended on research output and performance criteria. Instead of unquestioned general funding mission-orientated, contract-based research is financed.
- Industry R&D finance for university research is increasing: The emerging knowledge-based economy is strongly depending on scientific knowledge to capitalise on. Industry is increasingly willing to support university research in many forms (e.g. contract research, financing of researchers). This is especially the case under the light of decreasing private basic research and the perspective of option securing in an extremely uncertain technological environment.
- Demand for economic relevance increases: The pressure on universities to directly contribute to the national innovation system has increased significantly. Nevertheless, the traditional disciplinary structure of the university places strong rigidities and causes tension in the university research environment.
- University research is internationalising: the globalisation and the development in information and communication technologies affect the climate of research and the conduct of R&D. Not only business competition but also university research has become more competitive and more specialised.

- Systemic linkages increase: To improve the effectiveness of networks and feedback loops in national and international innovation systems universities are encouraged to enter into joint ventures and other forms of collaborative research with other institutions in the innovation process.
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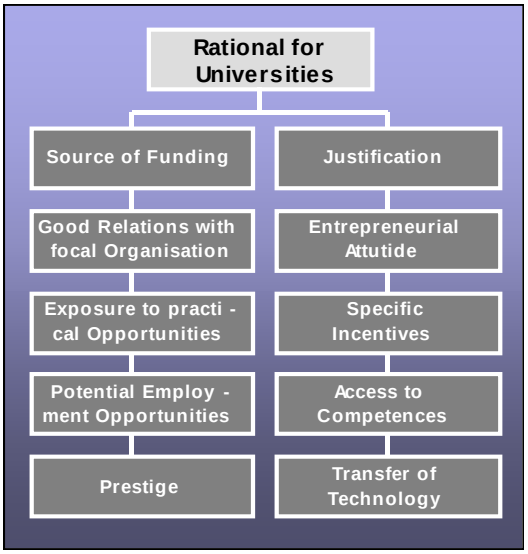
Figure 4: Rational for Collaboration with Industry



All these trends are very much interrelated and represent a great challenge for universities. As one can observe universities are more and more willing to play the new role as important partners within the system. Being service providers to industry and society is incorporated in mission and dedication of universities. In addition, within this redefined self-understanding they become more aware of their own performance and its value that may at least partly be retained by universities themselves. Thus, new approaches to deliver direct to economy and society in line with retaining direct returns are applied. Nevertheless, gaining and sustaining outstanding reputation within the global research community remains the basis for future prospect. However, capitalising on outstanding scientific results through increased collaboration with and funding by industry looses its overall bad flavour.

Academia is eager to establish mechanisms and structures that provide financial security without too much compromise on research freedom. Legal authorities provide active support aiming to promote technology transfer and to reduce their funding. Together with industry common and new forms of collaboration and shared financing either applied at home or elsewhere are pursued.

2.5. Academia-Industry-Government Efforts

The performance of the innovation system is shaped at three levels – individual, organisational and regional/national. It is embedded in the country's technology and innovation policy as well as in research and development promotion activities. From the legal authorities' point of view emphasise is shifting from industrial policies to innovation policies. Systemic failures, which block the functioning of the innovation system are addressed instead of subsidising industrial sectors (see table next page).

Figure 5: Systemic and Market Failure and Policy Responses

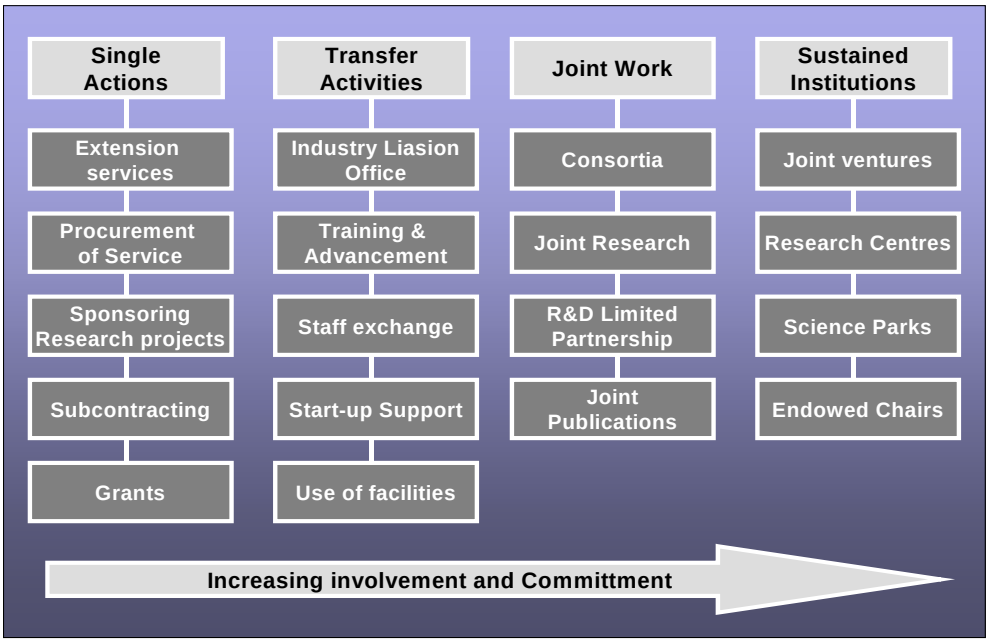
Systemic and Market Failure	Policy response
Inefficient functioning of markets	• Competition policy and regulatory reform
Informational failures	• Technology foresight • Strategic market information and strategic cluster studies
Limited interaction between actors in innovation systems	• Broker and networking agencies and schemes • Provision of platforms for constructive dialogue • Facilitating co-operation in networks
Institutional mismatch between (public) knowledge infrastructure and market needs	• Joint industry-research centres of excellence • Facilitating joint industry-research co-operation • Human capital development • Technology transfer programmes
Missing demanding customers	• Public procurement policy
Government failure	• Privatisation • Rationalise business • Horizontal policy making • Public consultancy • Reduce government interference

Source: Roelandt et. al (1999).

These policy approaches to encourage the creation of new knowledge and its diffusion have been widely discussed. Almost all European countries are somehow engaged to apply the most important for their country. These efforts concerning the macroeconomic framework conditions and public infrastructure have to be backed up by efforts of the major players within the inner circle of the innovation system. Collaboration between private industry and university evolve within this framework conditions but control can only be executed to a limited extend. Barriers and obstacles on the organisational and individual level also cause inefficiencies and insufficient performance. They have to be targeted on the level of occurrence.

With changing roles and expectations the conditions for improvements are favourable. External pressure is increasingly enforcing the willingness to compromise especially in university research departments.

Figure 6: Forms of Industry-Academia Interactions



Thus, diversity and nature of collaboration have changed and frequency of interaction has been continuously increased in recent times. Researchers and managers are challenged to design and execute collaborative activities creating benefits and valuable outcomes. All beneficiaries increasingly share the funding. Adaptation of well known forms from overseas and the development of new practices may lead to enforced technology promotion and transfer for the benefit of all participants. Some major forms are described in more detail.

Industry Liaison Office (ILO)

Universities become aware of the value created by their research. Thus, to capture a larger share of the profits associated with technological innovation the management of universities' intellectual property rights through an ILO is increasing. ILOs – also often referred to as Technology Transfer Office – formalise the university/industry technology transfer. They facilitate technological diffusion through the licensing of inventions or intellectual property resulting from university research to industry. Expected results are generating local spillovers with respect to technology transfer and generating income for the university through protecting and marketing the universities' intellectual property rights. The officers support and encourage the university scientists and researchers in the process of commercialisation of results in whatever form. The topic has been controversially discussed since the mission is somehow inconsistent with the traditional philosophy of providing free knowledge to the public. However, the effectiveness of ILOs seems to be highly influenced by (1) reward systems for faculty involvement in transfer activities, (2) compensation and staffing practices in the ILO and (3) actions taken by administrators to reduce informational and cultural barriers between universities and firms. Thus, the establishment of an ILO has to be part of an overall "re-engineering" of policies, structures and processes of universities. Considering the financial outcomes there is only evidence from the US where major universities are able to retain significant funds out of their IPR practices with sufficient security to plan with.

Spin-offs and Start-up Support

Spillover effects to the local economy pursued by ILOs are realised not only through licensing to established firms. Building up new companies based on commercialising results from university research has become the hallmark of transfer activities in the last years. Spin-offs and start-up's originating in the university context seem to bring about several advantages: (1) commercialisation of research results is supported (2) the companies normally reside nearby the university further engaged in a constant dialogue thereby building bridges between university and business sectors (3) initial spin-offs may be the seed for a future cluster leading to a virtuous cycle of spurring scientific developments and their commercial exploitation within a dedicated community of excellence. Quite clear, the ability to establish such technology based small firms is dependent on many factors from which university activity is just one. These factors have been addressed by general technology and innovation policies of legal authorities. Universities themselves are thought to take an active part within the infrastructure created. Within the universities general factors like business attitude and entrepreneurial spirit may be encouraged since at last the success of all these measures comes down to motivated and engaged people. Likewise, networking to establish contacts and relations to the relevant financial and business community are a way to support this as well. Industrial Liaison Officers and Technology Transfer Offices play a critical role in supporting commercialisation processes and supply the academics with relevant knowledge and expertise. Their influence and the effectiveness of their activities have been described above.

Problem-orientated and Project-based Collaboration

Since long, working together with universities to solve a specified problem has been a common approach. Collaborations of this kind range from pure research sponsoring and outsourcing R&D with minor involvement to joint research and R&D partnerships. In the past, industry participant providing funds and defining the problem to solve while researchers had full control of content, research approach and methods often characterised academy-industry co-operation. In many cases, this type of research turned out to be a source of frustration for the funder as discouraged R&D executives report. Other cases state a successful

competence sourcing of private industry within university departments. Nevertheless, the project-orientated dialogue even in successful cases is limited to a well-defined problem, which the company may have identified itself. The possibilities of academia-industry co-operation remain under-utilised since mutual knowledge absorption and learning effects are limited. In addition, for the university department short-term projects do not allow sufficient planning security.

Endowed Chairs

Providing funds to establish a dedicated chair in a university department is a common form of sponsorship in the US. During the last decade Europe has been catching up. An endowed chair often comes with the flavour of pure honoration of university achievements or emphasises the importance of an industrial person by giving the chair the person's name. It then reflects more the social engagement of a company or a person than being tied to specific expectations with respect to knowledge creation and valuable research results. Hence, the universities that have been granted a chair are often related to the company through regional proximity or personal relations. The already existing specific relations direct the funds. Very famous institutions may have a chance to get an endowed chair because of their overall reputation. Although the funds are naturally appreciated from a universities' perspective problems may arise.

If the amount provided for the chair is only sufficient for the establishing period, after a couple of years, the university is left alone with an additional cost factor. To build up a valuable research and education entity considerable amounts of money and personal efforts are needed. Short term sponsorship without a clear mission and vision from both sides may lead to a stop-and-go policy not leaving any results but consuming money better used elsewhere. Thus, careful co-ordination and planning is needed in the forefront to prevent unfavourable outcome of well-intended actions. However, endowed chairs remain a possibility to foster collaboration if future developments and long-term considerations are incorporated.

Sponsorship

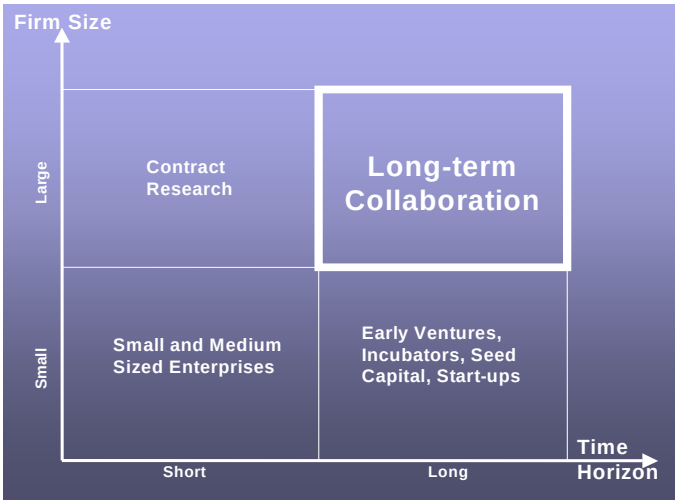
Thinking sponsorship provokes images of sport events characterised by colourful advertisements and athletes proudly (or not) presenting their sponsor's logo. Such presentations might not be appropriate for a university but in this context sponsoring has to some extend established as a suitable form to finance special events and activities often related to students. Sponsorship of equipment represents an appreciated form to improve the infrastructure limitations due to tied budgets. To no surprise, the sponsored department or university must have something to offer in exchange, at least prestige and the display of logos or similar. Like in other cases of private funding conflicts of interest may arise to be considered before taking action.

Grants

The practice of granting universities considerable amounts of money is very common in the US. Grants represent a usual way of social engagement and loyalty. Companies and private persons engage in this way. The later normally have a fare stronger relation to the institution they got their exams from than graduates in Europe. Alumni are widely organised and maintain frequent contacts to them. Especially for the famous universities the grants represent a continuous and rich source of funding, which comes with no outspoken restrictions.

All of these different interaction and collaboration forms are characterised by special features and motivated by different reasons. With respect to collaborations involving joint research and not mere sponsoring there is a trend to engage in more long-term relations not defined by a singular problem but the definition of a broader research area.

Figure 7: Unit of Analysis



Collaborations of that kind normally occur with a well-defined set of actors. Academic partners, who attract industry to spend money, are mostly larger universities with basic as well as applied research. They have the competencies and even more important the resources to carry out long-term orientated research. The industry partners are most often large multinationals searching for excellent research and education capabilities. They have the possibility to commit considerable amounts of money to collaborative research efforts. Small- and medium sized companies, which are of major importance to most European economies, are in most cases more interested in short-term, problem-orientated co-operation and lack the resources to maintain long-term efforts with insecure outcomes. Science-based early ventures and start-ups often partner with universities but cannot fund university research. Transfer of results and spurring economic developments is the main objective while seed money and venture capitalists provide capital. It is used to build up a company not existing yet. The focus in this study is on long-term collaborations between large companies and universities. Other forms have to be addressed in separate investigations.

Driving forces at the blossom of industry-academia collaboration have been described in chapter 2.3 and 2.4. The question is how to set up such long-term research collaborations and what are the success factors securing valuable outcomes as far as possible. This topic is addressed in the remainder of the paper. Therefore, some successful cases have been chosen with special focus on Swiss conditions and the most famous cluster area in Europe, Cambridge, UK. All of the collaborations have been set up in the last few years despite the Cambridge case, which had a remarkable history during the last decade. The research areas and related business sectors belong to the hottest in these days. Since the study has an exploratory character despite securing diversity in the targeted research topics the cases are somewhat biased by convenience because of the familiarity and access to relevant persons and organisations. However, as noted in the literature on case study research, convenience samples of organisations are common in inductive, exploratory studies, especially when funding is limited.

3. Cases: Telecommunication, Media, Biotechnology and Medical Devices

3.1. Searching for High Profiles: The Foundation of the MCM Institute at the University of St. Gallen

In 1998 the University St. Gallen founded the Institute for Media and Communication Management with major grants from the Bertelsmann Foundation, Germany.

3.1.1. Bertelsmann AG

Bertelsmann is a privately held German media giant with a turnover of 16,5 billion Euros in fiscal year 1999/2000 and a net income of 672 million Euros. One of the world's largest media conglomerates, Bertelsmann has interests in 600 companies in 53 countries. The company is engaged in publishing (Random House), music (BMG Entertainment), magazines (75% of German Gruner+Jahr), TV and radio (37% of European broadcaster RTL Group) and print services.

Founded in 1835 by Carl Bertelsmann, the company grew during the 19th century as a publisher of hymnals and religious materials. After World War II Reinhard Mohn (a descendent of Carl Bertelsmann) set about to rebuild the company and resume publishing.

Bertelsmann became known in Germany with its "book clubs" during the 1950s. It branched into music in 1958 with the music company Ariola. Later, they bought Germany's UFA (TV and film production, 1964) and an interest in the publisher Gruner+Jahr. In the US 51% of Bantam Books were bought in 1977 (and the rest in 1981) and Arista Records in 1979. In the 80s the internationalisation continued with the acquisition of RCA Records and control of Doubleday Publishing. In 1993 Mohn transferred substantial voting shares in the company to the Bertelsmann Foundation.

The 90s were characterised by a further development through acquisitions in the publishing (Random House 1998, 87% of scientific Publisher Springer Verlag) and broadcasting business (forming of CLT-Ufa joint venture with Luxembourg broadcaster CLT in 1997 and transformation into a new company RTL Group with rival Pearson's TV in which Bertelsmann owns 37%) and major efforts to position themselves in the upcoming new media, the Internet. The company teamed up with America Online in 1995 to form AOL Europe. They also took a 41% stake in online bookseller barnesandnoble.com and several other Web properties. In 2000 they agreed to sell the half-interest in AOL Europe to AOL, spun of Lycos Europe, the joint venture with Lycos (it retained about 27%) and made plans for an initial public offering of its Bol.com online book retailer. The company also agreed to develop e-commerce and mobile Internet services with Terra Lycos now that it has bought Internet portal Lycos. With the acquisition of CDNOW and the alliance with online service Napster the Internet activities continued into the music business.

The strategic goal is to become the world's leading global media company for content and media (e-) commerce. Therefore according to Chairman Thomas Middelhoff dynamic growth, independence and profitability has to be secured through new organisation and generational shift in management, orientation to content, adoption of corporate culture and the expansion of business into new dimensions. Since the company is a technology user rather than a technology producer there are no dedicated R&D departments or units within. The focus lies on applying the latest managerial, organisational and financial methods and techniques.

3.1.2. The Foundation of the Institute for Media and Communication Management) at the HSG

The University St. Gallen has been established as one of the leading European business schools throughout the last decades. Research and education are integral parts of the university. Research is seen to provide solutions for arising economic and social problems with "hands-on" and not within the ivory tower. Thus, practical orientated research and education within a steady dialog between science and practice is emphasised.

The activities to establish an institute dedicated to media and communication management were both initiated from private industry and university. The fundament to build on was developed throughout the 90s and based on the belief that the transition from an industrial society to the information society is under way. The area of media and communication would be a major topic in managerial science and education in the future. As early as the late 80s ideas were born to found a new institute to integrate the upcoming developments in the university's research and education agenda. The members of the Department for Information Management as well as the Department of Cultural Science promoted the ideas. They found their way into the strategic plans of the university for the next years. Unfortunately, the financial conditions at that time did not allow putting the plans into practice that soon.

In parallel around the early 90s the CEO of the Bertelsmann AG and Vice President of the Bertelsmann Foundation Marc Wössner signalled interest to start some activities together with the university in the media and communication field. Since he was a regular visitor to the university as a guest lecturer and speaker there were regular contacts. The ideas developed within the university during the last years were resumed. First concepts for a new institute for communication and media management were worked out. The fact that the main promoter of the idea, Prof. Beat Schmid, head of the Institute for Information Management, was also Vice Chancellor of the University supported the process. He and others recognised the signals placed through Marc Wössner and took the chance. The plans including financial statements of needed funds formulated by the university were presented within a personal meeting with representatives from Bertelsmann including the initiator Wössner. Both partners were able to figure out soon a common line of interest and action. The request for a considerable amount of money (about CHF 10 million for a five-year period) caused no problems and the planning for a detailed concept could be started.

The decision to ally with the University of St. Gallen instead of another institution was considerably influenced by its reputation. Bertelsmann CEO Marc Wössner perceived the University to be one of the leading management schools in Europe. Strong relationships born by regular contacts, recruiting activities within the University and participation in events like the ISC-Symposium undermined this perception. It is notable to consider that the Bertelsmann AG bases its success to a great extend on an extremely well developed and tied controlling and superior people. Therefore, recruiting of the best people is emphasised. Graduates recruited from the University St. Gallen had often shown above average performance within the company leading to the high reputation of St. Gallen as a superior management school in the eyes of Wössner. This defined the basis for the prediction that St. Gallen might be the right place to fund a dedicated research facility. To prevail with the idea within the corporation was no problem since the most powerful person was convinced. The formulation of a detailed concept was mainly supported by the HR-Director.

The funding of the social engagement of Bertelsmann AG is conducted through the Bertelsmann Foundation. The company itself does not fund such projects itself. The long-term engagement envisioned in the plans and the high amount of money needed is quite uncommon for the Bertelsmann Foundation. They proposed to invite another partner for the project. In Germany exists a wide network between several private foundations promoted and supported through various personal and informal contacts between persons in charge. The network was activated for the purpose of the project and the Heinz Nixdorf Foundation was contacted and asked to participate. Although the decision-makers there were convinced by the idea of a research and education facility for media and communication management, the first preference clearly was for a location in Germany. Caused by the arguing of Marc Wössner the advantages of the University St. Gallen as location convinced his counterparts at Heinz Nixdorf Foundation at last.

Within the University the project was strongly supported by Prof. Schmid. Under his conduct the whole process of founding a new institute at the university as well as the formulation of detailed concepts and plans could be carried out at a remarkable speed. After about three quarters of a year the proposal had been worked out in detail, realisation plans were defined and the whole thing passed all relevant gremia and boards including the ones from the political institutions. In contrast and to the disadvantage of a German location the less

bureaucratic approach by the HSG and the active support of local authorities favoured the HSG. The MCM Institute was officially founded in January 1998.

3.1.3. The Mission and the financial Arrangements

The overall goal for the establishment of an institute for media and communication management as formulated by the Bertelsmann Foundation is summarised in three points:

- Creation, development and supply of relevant media and communication competencies for a responsible design of the information society;
- Deliver media and communication capabilities as a crucial management competence to the leaders in economy, politics and society;
- Innovative and far-sight support of the European economy on its way to the information society.

Education covers courses for undergraduate students, a PhD program and, starting in 2001, an Executive MBA program. Research is focussed on management in the media industries, e-business and electronic markets, knowledge management, corporate communication, communication law as well as media and society. Therefore several competence centres have been established. The results are immediately incorporated in the teaching.

As a precondition for the private funding the University St. Gallen supplies the same amount of money as the private investor does. The funding through the Bertelsmann Foundation and the Heinz Nixdorf Foundation is intended as a start-up financing for the institute restricted to a defined period of time. The money was dedicated to enable the building up of the institute but not as a long-term base financing without a timely limit. According to clear guidelines the money has to be used for specific purposes. The funds are to be used for building and maintenance. They are strictly allocated to the educational and research activities of the institute. After the start-up phase of four years the funding from industry will end. From then on the institute and the University are in charge for the financing through other grants and funds. The endowed chair within the institute will be supported for five years. In addition the MCM institute maintains other strategic partnerships with a number of firms. They also contribute on a regular basis to the financing of the activities.

To date the institute has established as one of the leading centres in Europe for its topic. About 60 people, mainly PhD students and scientific staff are working with three professors in four centres of competence. The courses as well as the executive educational programs offered by the institute are well appreciated by the students and participants. They are being continuously improved to meet the requirements of the future.

3.1.4. Underlying Motivations and Objectives

The rising contribution of resources of all kinds from companies to university research and education may be explained with stronger underlying shifts concerning the productive resources of a firm. Emphasise shifted from capital to knowledge. There exists a broad basis of organisational knowledge that has been build up over decades within organisations. This knowledge is embedded in organisational processes and routines. Today organisational structures and the people acting in it have become more flexible than ever before. Organisational boundaries are blurred through on-going mergers, spin-offs and recombination of the companies. Thus, this organisational knowledge is decreasing and loosing value due to the increased development pace within the economy. Within this framework not the organisational knowledge, processes and routines are crucial but flexible teams able to constitute fast and achieve high performance soon. They bring together the needed up-to-date content knowledge and methodological competencies to succeed fast. Unfortunately for the companies those teams normally have not those strong ties to a specific firm and do not prosper within highly structured environments. At last, these developments have consequences for the classical in-house research and competence creation. Innovative high performance teams are increasingly found in dynamic university environments, which therefore become very attractive for companies. This is very visible the case for the so-called “New Economy” sectors like IT and Biotechnology. Start-up and spin-off activities evolve in an environment of creativity and entrepreneurial spirit around and in close interaction with research institutions.

In this context universities are increasingly perceived (again) as fertile grounds for creative ideas and concepts to which access is critical to stay up to date and future prospects.

Companies are looking for substantial continuous dialogs and partnerships instead of short-term, project-orientated relations. For the Bertelsmann AG (through their Foundation) the institute provides such a background for their commercial activities. On the one hand side a facility for relevant research and concept development is established, which is attractive to the addressed creative heads, on the other side high-profile specialised education of potential employees is secured. The participation of other strategic partners in the research activities of the institute does not undermine the intent of the main contributor. The model allows firms to pool their research activities, which would otherwise be duplicated in-house and may not attract the high potentials available at the university. The return does not only consists of the results delivered by the institutes members but also in the interaction and networking platform provided. It serves as an exchange of experience and joint brain pooling in addition to research results. This collaboration is secured through the institute's requirement of active participation in the work in contrast to pure sponsorship without direct dedication to the subject. This kind of organising networking and collaboration between firms may be perceived as favourable over bilateral or consortia like co-operation.

Before actual work starts the practical impact of the achieved results cannot be determined. Especially concerning social science the relevance and usability of outcome is hardly predictable. The mission of the University St. Gallen as a whole and the long tradition of application-orientated research have secured the partners that the MCM institute will achieve valuable forthcomings. However, after two years of operations the researchers have justified themselves. The establishment of a network of spin-off firms around the institute enhanced the attractiveness and the practical competence since they are able to provide solution for more consulting like problems while the institute itself concentrates on satisfying the research-driven needs.

Interest and motivation of the University of St. Gallen are found on two sides. Naturally the funding was appreciated because expenses were rising and other sources were stagnating or even decreasing. Conducting comprehensive research at high level needs appropriate resources, which allow more than arms length planning. The sources available to Swiss researchers like the "Nationalfond" or grants from the KTI are project orientated. Proposal writing and approval contain much inflexibility and bureaucratism. People belonging to the decision boards often follow their own interests and show retention towards emerging developments. Meanwhile private industry acts more flexible. Apart from the financial aspects companies are a valuable input source of knowledge for current research. Therefore the MCM institute is requesting financial resources but also commitment, substantial participation and knowledge transfer from companies to university. The aim is to achieve a fertile collaboration within a cluster or network of university research, spin-off and start-up companies and established firms that inspire one another.

3.1.5. Main Features and Assessment

To date the foundation of the Institute for Media and Communication Management through the Bertelsmann Foundation and the University St. Gallen demonstrate an example for a good practice of university-industry collaboration. The main points contributing to the success of the model can be summarised as follows:

- The outstanding reputation of the university in research and education;
- Personal engagement and networking between relevant partners;
- Will and competence to translate the concept into action with considerable pace;
- The vision leading to an integrated approach and conception for the collaboration;
- Justification through success in the last three years.

As described above the University St. Gallen is famous as a management school throughout Europe. In industry the institution is well known for their high-profile management education for graduates as well as executives. Their approach to research always bears in mind the practical-orientated, problem solving character out of the ivory tower. These fea-

tures attract private companies and secure them to gain valuable results in return for their resources.

As in many other cases the ground has been well prepared by the action of individual people before some form of joint actions between university institutions and private corporations took place. In the considered case strong relationships between relevant people provided the basis for discussion and formulation of a common language. A constant dialogue between industry and university cultivated through events, guest lectures etc. allow the evolution of personal and organisational relations. Within this frame ideas for closer co-operation and long-term engagements are encouraged and brought to blossom by the personal commitment. Since the people knew each other, the setting up of collaboration was much more straightforward. The window of opportunity could be used. This is exactly what happened in the case of Bertelsmann and the University St. Gallen promoted by CEO Wössner and Prof. Schmid.

But the ground was not only prepared with respect to personal relations. The idea of setting up a facility for research and education dedicated to the emerging management issues in media and communication has evolved and was rethought long before. The speedy realisation of the project had not been possible without the work in the years before. The university was well prepared to catch the opportunity when the complementary of activities and interests showed up. Another favourable circumstance was the relative autonomy of the university concerning the establishment of new undergraduate program as well as institutes for special research and education areas. The university is enabled to react flexible to changing requirements and context. With respect to industry collaboration that means the public institution may act at nearly the same pace as the private company without applying too much delaying bureaucratism and formal procedures.

The vision and conception of the MCM Institute is an integrated one: on the one hand side it is not only focused on unilateral transfer of specific resources and results, on the other hand it does not only cover the direct co-operation between the partners but it is embedded in a wider context considering the whole network. The operating procedures and work arrangements oblige all partners to dedicate several resources to the collaboration. The corporation does not only contribute in terms of financials nor does the university only supply specialised research results. The active participation of the main company Bertelsmann and the other partners is seen as a prerequisite for maximising benefits. They provide input for research and secure that relevant areas of interest are addressed. In return the Institute delivers science driven but problem-orientated results and a platform that spans not only universities research but is also committed to high-profile education. Thus, the Institute represents the centre of a network that links relevant people and organisations for multiple purposes.

The expectations tied to the foundation of the institute have been fulfilled to date. The establishment as a centre of excellence in the field of media and communication management education and research is well under way thanks to the significant start-up financing of the Bertelsmann Foundation and the Heinz Nixdorf Foundation.

Benefits for the Participants

Industry Partner	University Partner
• Establishing a ‚think tank' outside the company with access to relevant skills and competences otherwise not available	• Realising strategic plans to enlarge research and educational agenda with a topic still increasing in importance
• Sharing costs of research with other participants and shift educational costs to university	• Exposure to practical problems and company input, which increases research relevance and value
• Securing relevant education for junior executives and a pool of people for hiring	• Improving potential employment opportunities for students and faculty

3.2. Accessing Ideas: Establishment of Medtronic Inc. European Headquarters and R&D near Lausanne

In 1997 Medtronic Inc. moved its European headquarter from Brussels to Tolochenaz in the Lausanne area. Right from the start they established research collaboration with departments from the Ecole Polytechnique Federal Lausanne (EPFL) and the Vaudois University Hospital Centre (CHUV).

3.2.1. Medtronic Inc.

Minnesota based Medtronic Inc. is one of the leading companies in medical technology. Employing about 25.000 people sales in fiscal year 2000 were about $ 5 billion with a net income of $ 1.01 billion. R&D expenses accounted for roughly $ 500 million.

The company was founded 50 years ago in Minnesota, USA, by an electrical engineering student and is brother-in-law. They created a business for repairing medical equipment for local hospitals. Working closely with their physician customers they started to design and build new medical devices – e.g. the first implantable pacemaker. This tradition continued to date with research and development in products and therapies in cardiac rhythm management, vascular, neurological and spinal therapy and cardiac surgery. Strategic mergers and acquisitions of relevant companies around the world constantly fuel product lines and new market access.

The company's products are available in 120 countries around the world. The overall organisation consists of an integrated global network with people and resources located close to patients and physicians around the world. The activities outside the US are organised in three geographical areas, the Americas mainly consisting of South-America with headquarters in Minneapolis, Europe/MiddleEast/Africa with headquarters in Tolochenaz, Switzerland and the Asia/Pacific region managed from Hong Kong.

R&D have been established in Europe in the Netherlands 25 years ago (Bakken Research Centre). Further activities in Europe are initiated because the regulatory environment favours the location over the US. Although basic research is still ahead overseas, with respects to application development the European countries are on the forefront. Applications can be brought faster into practice so that practical experience of physicians is some time ahead of their American counterparts. Since the physicians are the main source of ideas this fact contribute significantly to build up stronger research in Europe.

3.2.2. Moving Headquarters to Switzerland

The Medtronic headquarter for the region Europe/MiddleEast/Africa has been in Brussels until the mid 90s (without any R&D). Around that time ideas of restructuring the

European activities occurred. With the beginning 90s the lead in application development moved from the US to Europe. Several locations have been considered but Switzerland appeared to be an appropriate choice. In fact the CEO for the region mentioned that it even turned out to be better than expected even in areas that had been considered as unfavourable.

The country is known for its stable political and economical environment. There is not much to add to other investigation, which mentioned that point many times. The central location of Switzerland made a special point since Medtronic is running many educational operations with practitioners like physicians and nurses. The location fulfils the need of being reached easily from all over Europe. In contrast to their expectations the overall cost standard turned out to be lower than predicted. The culture and the values inherited in the Swiss society seem to match the corporate culture.

Within Switzerland the regions considered by the former CEO in charge were Neufchatel, Geneva and Vaud (the relocation process was initiated by the former CEO for EMEA but the actual decision for one of the different regions within Switzerland by its follower). Since Neufchatel was out of competition because there was now airport within considerable distance the two other Swiss Romand regions remained. Negotiations were started to develop reasonable concepts with respect to tax regulations and other legal settings. At last the decision for Vaud depended on the living conditions that were perceived as fairly different from Geneva although both are within short distance. The American people preferred the Lausanne environment since it remembered them more of there American headquarter setting in Minnesota. The overall investment in administrative and manufacturing facilities (most pacemakers are now manufactured in Tolochenaz) was about CHF 60 million. In January 2000 the company announced the investment of another CHF 60 million to expand the facilities in Switzerland. To date about 400 people are employed in Tolochenaz.

There have been some points nobody was aware of that turned out much worse than expected: the taxation of employee stock options, public security and at least the abandonance of Geneva as a flight head by Swiss Air.

The use of employee stock options to compensate people is common to American businesses and grows in popularity in Europe. Especially excellent people are often attracted by that payment arrangement and it proves to be a suitable incentive. Law in Switzerland specifies that stock options are taxed at the point of grant and not at the point of exercise and non-refundable tax applies to the value of the actual share price. So people have to pay before they have the money in their pocket. This practice reveals to be very uncomfortable and is a major obstacle to investment in Switzerland. In addition social security payment applies to the value of the stock options at the moment of grant and not exercise. You have to pay money long time before you eventually get it back through the exercise of the options. The overall tax regulations in this point are seen “as a knife in the heard of investment in Switzerland”.

The second problem occurs with security. There have been several robberies and hassles diminishing the standard of living in the region and decreasing reputation. Public presence of police is nearly non-existing. Increased security presence would be very much appreciated.

From a more technical point of view Switzerland offered some distinct features concerning the core competencies the country is known for. It has a strong record in engineering and other technical sciences. High precision and quality craftsmen are at least known from the watch industry but as well from micro mechanics and microelectronics, assembly and many more. Automation and robotic expertise is also part of the country's capabilities. All these things are needed for carrying out Medtronic’s high-profile manufacturing of medical instruments and devices. In all of these areas an educated workforce and highly skilled people are available. Although Medtronic relies in technology and application development nearly 100% on internal capabilities, they are heavily depended on ideas of practitioners and medical research. Therefore, close co-operation with relevant institutions is critical to the firms’ success and the company actively seeks co-operation with them. Several advanced institutions around the country exist. The strong pharmaceutical industry and the developing

biomedical industry in Switzerland add to that point. Thus, Switzerland is a nearly perfect basis for their purposes.

3.2.3. The University Environment

The Ecole Polytechnique Federal de Lausanne (EPFL) belongs to the leading technical science schools in Europe. With about 210 professors and over 2500 scientific and administrative staff around 5000 undergraduate and PhD students are educated. Education is organised in 12 engineering and architecture disciplines. In addition to the publicly financed budget the university is heavily relying on external research contracts and partnerships, which account for CHF 100 million.

Research is seen as an investment for the future and committed to the search of new knowledge. Since budgets are inevitably limited EPFL follows several principles do deal with it. First, high standards have to be maintained to attract the best professors, researchers and students. Further, the institution encourages strong relations to other research organisations and to industry. Linkages between basic and applied research as well as research and teaching are supported. Last but not least EPFL concentrates on interdisciplinary strategic research areas building on fundamental science to leverage the strength of research. The main focus is on sustainable development, biomedical engineering, nanosciences and nanotechnology, biotechnology, numerical simulation, information and communication systems and new materials. Within this areas large-scale projects with other institutions are pursued.

Biomedical engineering efforts are pooled with the Vaudois University Hospital Centre (CHUV), the University of Lausanne and industry partners. EPFL units mainly involved are the Department of Micro Engineering and the Department of Electrical Engineering. One of their main industry partners is Medtronic Inc. They jointly conduct research projects aimed to deliver concrete results by combining basic with applied research. The external collaboration with strong industry partners helps to provide the funds needed for research and secures the practical value of the conducted research.

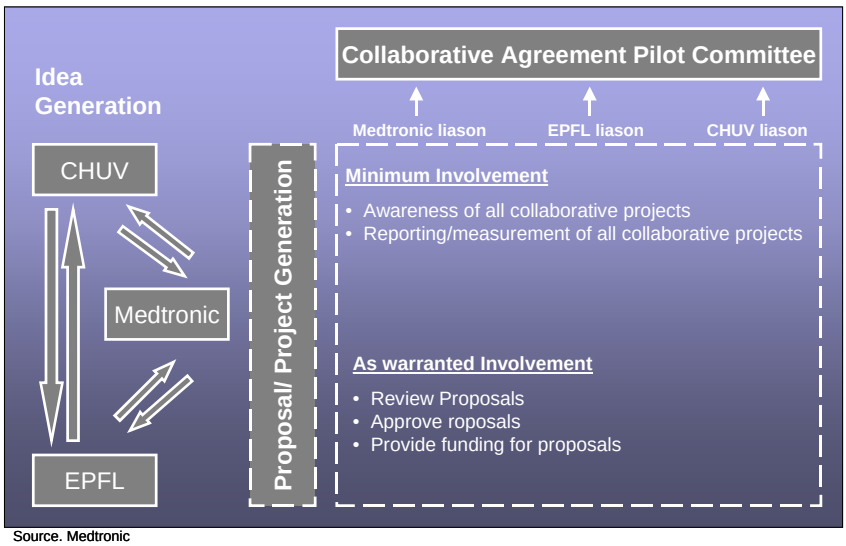
3.2.4. Collaboration with the University Environment

Right from the start in Tolochenaz Medtronic tried to build up close relations and collaboration with the surrounding research institutions. The intention was to start with geographically close universities like EPFL, CHUV and the University at Geneva and to expand then to institutions elsewhere in Switzerland.

The first actions undertaken were presentations of the company and their interest at EPFL, CHUV and in Geneva. Researchers and Physicians were invited to discuss collaborative activities and joint projects. Since the response in Lausanne was very promising in Geneva there was merely none at all. The R&D head responsible for collaborative actions was told that the perception of collaboration with industry in Geneva has a bad flavour. Academic staffs as well as students reject it. Although there were considerable efforts to change that attitude a second similar event a year ago showed mainly the same result as back in 1997.

Contacts to the CHUV had been established long time before Medtronic moved it's headquarter and set up R&D in Switzerland. Fertile work with people at the CHUV was dating back as far as 1985. Therefore a framework agreement on collaboration could be established soon. Since the collaboration with industry is a kind of a research principle at EPFL their participation was no matter of long discussion.

Figure 8: Collaborative Agreement Process



Source. Medtronic

The outcome was a framework agreement of intent in which the three partners – EPFL, CHUV and Medtronic – committed themselves to collaborate for the benefit of each partner (see figure). Under the roof of this framework individual projects can be conducted by all three partners together or either by two of them. The agreement reduces the bureaucratic burden since not every single project has to go the long way through several approvals. A pilot committee is installed consisting of one or two persons responsible for liaisons from each partner. Their responsibility is to oversee the collaborative activities and deal with general problems like funding or the handling of intellectual property rights. It is worth noticing that Medtronic is clearly committed to provide funding but the total amount of project financing has to be a balanced mixture of sources. Medtronic is not willing to fund jointly conducted projects on its own.

The collaboration is limited to special topics. Instead of pursuing projects in all medical areas, actions are concentrated to cardiac pacing, neuromodulation and flow preservation. Project proposal may be initiated by all of the partners. Although the agreement is valid for all Departments at EPFL, naturally, there are some especially suited. Thus, the main partners from EPFL are the Department for Electrical Engineering and the Department for Micro Engineering.

Intellectual property rights are handled in each individual project contract. Normally Medtronic claims the rights exclusively. Knowledge diffusion is prevented through the work with trusted people and the normal patenting and branding activities. In most cases the projects findings are not applicable without complementary capabilities and high investment barriers apply. Because rules on this topic have changed recently it is not quiet clear what the situation will be like in the future. There may arise some problems since confusion about the interpretation of the new regulations exists.

3.2.5. Main Features and Assessment

The headquarters' move to Switzerland turned out to be favourable in terms of the overall conditions found in Vaud. The collaboration agreement with EPFL and the CHUV led to considerable results. The success is mainly based on the following points:

- Willingness and attitude towards industry/university collaboration at EPFL, CHUV and Medtronic;
- All three partners a unified by strong complementary objectives; the commitment and benefits are clear to each of them;
- The agreement negotiated at the beginning provides a flexible and non-bureaucratic framework for joint action;

The attitude especially at EPFL towards collaboration provided a favourable starting point for the establishment of joint actions. Within the institution collaborative engagement with industry is more appreciated than seen as selling the main research interest. The personal relations existing within the CHUV eased the initiation of joint research projects.

To day, there are several successful projects conducted under the roof of the collaborative agreement. The average project duration is about one to three years. Basic research

with time horizons from eight to ten years is not carried out. Where actual problem solutions aren't visible there is no chance to get divisions within Medtronic interested. Nevertheless, it is important for the company to be near a research facility, which is one of the most active in research that may become relevant in the future (e.g. nanotechnology). All three partners provide resources. It is worth noticing that projects under the lead of Medtronic are extremely successful in getting funds from the Commission for Innovation and Technology (success rate 100%). This funding mechanism gives the possibility to conduct more projects since the overall fund needed for each one is significantly reduced. Within the approved new "Nationale Schwerpunktprogramme" there are areas that favour the research carried out by the partners. Possibilities for funding support may also increase with the sixth framework program of the European Commission (the Fifth Framework Program did not contain the most relevant areas for Medtronic).

The benefits expected could be achieved. Medtronic gets access to advanced knowledge. Even more important, the chances to get ideas and relevant proposals coming out of the CHUV and EPFL are very high. Medtronic could establish as the first point of contact in case an interesting topic is emerging. The joint projects allow Medtronic to carry out a lot of work with excellent people without having them on their payroll. Access to research facilities is given at no special cost. Thus, more money is left to spend on the projects. In addition a pool of excellent people mainly from the PhD students is available for hiring. Since they knew each other from their joint work expectations are clear and no risk involved for both sides. The main benefit seen for EPFL is to guide research to relevant areas. The EPFL represents a gorgeous mind that had to be directed to get the most benefit out of it. Medtronic brings the market into the university and secures that the things done are the right ones. For an institution like EPFL, which is very much concerned about application of its research, this is a clear benefit despite the funding. In addition the agreement has the function of a catalyst for establishing closer links between EPFL and the CHUV. The latter benefits in terms of getting access to technology and knowledge from EPFL and Medtronic. Recently, the company announced the funding of an endowed chair for Experimental Electrophysiology at the CHUV, the first endowed chair ever at that institution. Overall, a convincing win-win situation for all participants has been established.

Benefits for the Participants

Industry Partner

- **Getting access to ideas**
- **Leverage Company R&D efforts, more projects can be conducted**
- **Access to potential employees**
- **Access to facilities**
- **Getting a window on emerging technologies**

University Partner

- **Securing relevance of research topics and market orientatation**
- **Access to additional funds from the company as well as the goverment**
- **Improving potential employment opportunities for students and faculty**

University Hospital

- **Access to technology and knowledge**
- **Access to additional funds from the company as well as the goverment**
- **Possibility to articulate problems and ideas to the right people**

3.3. Capitalising on Research Excellence: Acquisition of Oracle-Olivetti Lab at Cambridge through AT&T

In 1998 the Olivetti-Oracle Cambridge Laboratory was acquired by AT&T Corp. The Laboratory is headed by a professor for communication engineering from the University of Cambridge since its founding in 1986 and deeply routed within the university context.

3.3.1. American Telephone & Telegraph Corp.

AT&T Corp. is not merely a firm – it's a legend. Today it is among the world's premier voice and data communication companies serving consumers, businesses and government with a turnover of about $ 62,4 billion and a net income of $ 3,4 billion.

Since the founding of Bell Telephone 1877 and New England Telephone 1878 (combined 1879 into National Bell Telephone) the company has faced many challenges. Still in the 19s century it became the parent company of the Bell Systems, the American telephone monopoly.

By 1925 it was recognised that telephone technology was increasingly based on science and scientific knowledge. Consequently, the Bell Laboratories organisation was established to do research and development as well as system engineering. The Bell Labs became the world's leading source in communication technologies generating more than 40.000 inventions since then. During most of the 20th century they played a pivotal role in inventing and perfecting key communication technologies. The average home contains at least 25 products stemming from innovations at Bell Labs e.g. telephone, TVs, remote control, radio, CD players and computers. This organisation was the backbone of Bell Systems fuelling the companies' development and establishing a strong research culture within the company.

With the divesture into seven regional Bell operating companies (the "Baby Bells", 1984) and the new AT&T Corp. the old Bell Systems was dead. Exposed to competition the company faced a hard time in the 80s to adjust corporate culture and deal with the falling market shares since competition in the remaining businesses was steadily on the rise. The strategies pursued after the break up in 1984 increasingly became inappropriate in the 90s. In 1995 the company announced the restructuring in three separate publicly traded companies: Lucent Technologies as a systems and equipment company taking the famous name of Bell Laboratories, the computer company NCR and AT&T remaining with the communication services (and the former researchers from the labs active in that field renaming the research and development facilities AT&T Laboratories).

AT&T Corp. emerged till then as an "any-distance" company handling not only voice calls but providing connection to any kind of information in any form. Today they are operation in four business units: consumer services, business services, wireless and cable. The business service unit is the companies' top revenues generator. Cable business was the core of the strategy pursued by CEO Armstrong since 1997 but progressed slower than predicted. The long-distance revenues are slowing the companies overall growth. Plans have been announced to break-up again to give investors the chance to value the company's activities individually.

Research and development is still a high priority at AT&T. The Labs provide the technology leadership and R&D expertise. Nevertheless the emphasise has changed. The established research culture of Bell Labs incorporated a high degree of freedom and pursued a kind of "blue skies" research. To become a leader in the fast-growing data and Internet markets rates of innovation have to be increased and focused. The research division realised that the environment has greatly changed requiring very different skills and behaviour for success. Priding oneself for more than a century of scientific and technical excellence and waiting for great inventions that might fit into the companies' portfolio is no longer a feasible strategy.

In late 1998 AT&T acquired the former Olivetti-Oracle Laboratories at Cambridge, UK, making it the first research facility outside the US. Besides of shopping for research excellence the acquisitions meant buying a research and commercialisation culture enhancing their own capabilities.

3.3.2. The Cambridge Spirit and the Oracle-Olivetti Research Lab

Cambridge University is known for its strong ties to industry and extraordinary growth in science-based firms is taking place in the region. The cluster emerged without any institutional strategy over the past decades. In fact, there is and has been much more chaos and confusion than systematic approaches. Regarding extramural activities of researchers Cambridge University is one of the most liberal institutions. They can act as free agents; the University places no impediments or obligations. Informal rules and standards of the researchers are strong enough to prevent them from doing anything that might hurt the university, basic research or education. In parallel industry collaboration has always been common in Cambridge.

Within this frame evolved the Oracle & Olivetti Research Laboratory. Founded in 1986 and headed since then by Prof. Andy Hopper the facility established itself as a leader in communication technology research. Hopper has been a PhD student in Cambridge and managed to become a professor in the Department of Engineering until the mid 80s. In the meantime he founded several companies, some of them on the technology basis of his research works. The companies were completely separated from the University. In return to the possibilities provided, funds were given to the University. He was introduced to Olivetti because the company would have liked to invest in one of the companies he founded. Later, they offered him to run a private research facility in Cambridge, which became the Olivetti Laboratory.

It is established close to the University but not embedded in the University. Although "the wall is as thin as a cigarette paper" clear separation lines exist. The Lab is very expert in sustaining a relationship that is not to close and not to distant from University. This is managed through operational but not contractual agreements, which emerged over time. Hopper carries out the management of this balanced relationship through his dual role of being managing director at the Lab and professor at the Department of Engineering. This allows forging strong links between academia and industry by harnessing and focusing the capabilities, experience and resources within the laboratory and the university. While the emphasise in the private lab is on selling ideas, money and business, all academic activities are restricted to University. The lab is plugged into the relevant research community worldwide. Results are commercialised through spinouts financed by Venture Capital with the guidance of Hopper. Considerable success has been achieved over the last decade.

However, the Laboratory is first of all a place to generate and develop ideas with an eye on their later commercialisation. The main sources for ideas are the local intellectual and academic pool. Access is provided through the PhD students and networking facilities at Cambridge. Hopper supervises about 15 PhD students which all have also industrial supervisors in different companies. Naturally there is exchange between the students themselves and with Hopper. Organisations like the 'Cambridge Network' or '3T' (to which companies and peoples may subscribe), professional organisations and meetings contribute to exchange as well. This all encourages networking and acts as mechanism to distribute knowledge and ideas. Again the personal union of Hopper enforces widespread access.

The company does not employ PhD students that contribute to the work in the laboratory. In return some money is paid to the University. All intellectual property rights are contractually assigned to the company. This allows the people to use all facilities without restriction and to get access to all available knowledge. Most students pursue to work on the same research topic in the lab and in the university. Thus, technology tends to go from the company in the university since they pick up themes in the lab transferring it into university. Unwanted knowledge diffusion occurs only in case that the students hire with a competitor. In practice most of the PhDs stay with the lab or end up working in one of the spinouts.

3.3.3. Acquisition through AT&T

Until the mid 90s about 30 people were working in the lab. Since Olivetti was not able to provide more money to expand the lab Hopper together with Olivetti was looking for another investor. In 1996 they found Oracle willing to match Olivetti's funding. The lab was expanded to about 55 people then. Legally Olivetti remained the owner but contractually they made it a 50:50 joint venture between Olivetti and Oracle. Probably Oracle might have

bought the whole thing but the company had no research culture at all to understand what's going on in the lab. Therefore Hopper preferred to be funded by both companies although a further withdrawal from Olivetti seemed likely. With this arrangement the long-term future of the Laboratories remained unsecured. To end the confusion the partners finally agreed to sell the lab.

With the research excellence proven over a decade, the location in the heard of Cambridge and the access to outstanding brains it was not a problem to find companies interested in buying the lab. At last the decision was made in favour of AT&T. With its mission and research background it presented a suitable company to partner with for the future. As the reader might have expected there were also strong personal linkages into the company. A PhD companion of Hopper has been working for AT&T for ages. He was strongly involved in the acquisition process and is now the main bridging person who explains the company and its need to the Lab.

The acquisition brought not much change to the Laboratory. From Olivetti Research Ltd. it changed to AT&T Laboratories Cambridge Ltd. Projects are carried out like before in close cooperation with the University (visits the labs homepage and find a link to the University's Laboratory for Communications Engineering for more detailed project descriptions). AT&T replaced Olivetti and Oracle in terms of ownership and funding. They also gave a benevolent chair to the university.

3.3.4. Objectives and Present Status

The former Olivetti-Oracle Research Laboratory was incorporated in AT&T's research organisation. It is now the first facility of AT&T outside the US. Since there were several companies interested in buying the lab Hopper was able to realise his expectations of a partner to proceed into the future.

Considering the experiences made with Olivetti and Oracle it was important to Hopper to find a company that could provide a perspective why the lab exists and what it is good for. The buying company should have a suitable mission and research background to make a long-term commitment. They were not looking for someone only providing money for a nice research playground. Therefore, the preference was for a company that feels a little threatened within its marketplace. Since those companies tend to be more flexible in commercialising and incorporating ideas in their business this would give the lab also a vision and direction. On the other hand side the laboratory should be preserved as a place to breed ideas not too much tied to the business strategy of a special company. The successful model of a liberal research approach combined with entrepreneurial spirit to commercialise the results should not be fundamentally questioned.

For AT&T the laboratory enhances the research capabilities of the company in communication technologies. The expectation is to generate basic technologies for the AT&T future. Projects are accepted as speculative in nature but the focus is on the construction of robust, substantial working systems that can be evaluated for their real use and commercial potential. Profits are retained either through exploitation within the business units or through share holding in spinouts created by the lab. The latter has been the strategy ever since the Lab's foundation. In addition, expertise about spinning out companies is brought to AT&T. The Cambridge laboratory has a record in direct transfer as well as doing spinouts. There might be a great number of ideas within AT&T benefiting from that approach but the company actually never did that. Hence, a good reason for acquiring the lab was getting access to relevant capabilities to do so.

Regarding competition within the different research facilities at AT&T the new one put not really a threat to existing ones. In fact, they are more complementary than competitive. Intellectually, there is no competition because the work done at Cambridge always implies a hardware component. When AT&T split in 1995 all hardware research went to Lucent Technologies and the system software, theoretical and mathematical research remained with AT&T. Therefore both organisations are intellectually complementary. From an operational point of view the situation to day turned out the following: over the last month tensions arose within the company since the share price nearly halved. That has not lead to an intensified competition for research funds but an increased need to use the expertise in commercialising

research results through spinouts. In the meantime, Hopper is conducting seminars with his research fellows how to do that. His business experience and his contacts mainly to venture capitalists are well appreciated by his colleagues. Furthermore, not being too much dependent on AT&T regarding his career turned out to be an advantage. The new facility brought the ability to point at things people from AT&T haven't been able to even see (e.g. transfer practices). In other words one might say AT&T bought not only research competence but also a kind of management consulting.

AT&T does not considerably influence the project selection within the laboratory. The selection process consists of several stages. A first component is the environment. The described Cambridge networking provides a kind of informal selection mechanism. Within the course of interaction and exchange, the community detects bad projects. The laboratory is somehow calibrated through the surrounding community. Hopper finally does decision making in the laboratory. Preliminary, a strict peer review through experienced research staff is done. They try to assemble a variety of projects including at least two projects that are the best in the world in this field. A special feature is an extremely experienced professor emeritus with a famous track record. He is a kind of premium project proposal evaluator. The projects are also evaluated with respect to their potential of creating future business for AT&T. Therefore arguing the line of research within AT&T does not place special problems. The review from the company takes place once a year. Peer researchers do the project review what is quiet easy as long as they do not feel in competition of funds. All in all the company review process is loose.

The course taken since the acquisition in 1998 remains successful until now. Negotiations for the first spin out are under way at the moment. Research has been transferred into the company and specific technology was licensed to third parties. Over a five-year period the Cambridge laboratory has been responsible for inward investment for research, spin-off companies and university funding of over £ 120 million.

3.3.5. Main Features and Assessment

The history of the Cambridge Laboratories can be seen as a success story fuelled by the following sources:

- Strongly supporting environment not in terms of formal arrangements but informal rules and infrastructure;
- Personal engagement and entrepreneurial spirit;
- Balancing proximity to and distance from the university;
- Common objectives, complementary competencies and a strong, shared vision;

The context provided in and around Cambridge University allowed the development of a strong cluster. It is worth noticing that all encouraging activities have been launched at a time when the development was well under way. The Cambridge Science Park has become quiet famous now. Actually it was set up after a lot of technology and science-based start-ups have been founded in the region. It was not the starting point but put around an existing structure. The launch of a University Licensing Office to help academic stuff handling intellectual property rights including disclosure, patenting and licensing was just a short time ago. These activities are carefully designed not to disturb the strong informal rules and structures. The service of the licensing office is non-exclusive. It may be used but its no obligation. The academic staff is as free in exploiting their research as they have been. Quite common is the practice to fund the university in case of a successful commercialisation of research results. Again this is no obligation but a kind of informal rule deriving from loyalty and practice. The entire environment is totally free, hence, allowing using opportunities. Since no one has been actively encouraged to do so, the outcome depends on the personal engagement.

To a great extend the success of the Cambridge Research Laboratory located at the crossroad of university and private industry is due to the person Hopper. He had the eagerness to use the possibilities provided within the Cambridge environment. His personal engagement, entrepreneurship and the business attitude applied led to this remarkable success. In his dual role he was able to balance the university and the industry interest; on the one hand side separating both areas, on the other link them to the benefit for both.

The combination of academia and industry has been eased by carefully looking at common objectives. The acquisition by AT&T did not render the operation of the laboratory. The vision of AT&T and the self-understanding of the laboratory were strongly complementary. They can build on a shared mission statement for the laboratory and combine their competencies in favour of both.

Benefits for the Participants

Industry Partner	University Partner
• Access to valuable scientific competences at low cost through PhD students	• Access to funds for much more research projects
• ‚Think Tank' for long-term pay-off ideas	• Providing staff and PhD students with much more research ideas and possibilities
• Leveraging knowledge through pooling competences and resources from university and company	• Strong relations to business community
• Plug-in to the relevant research community and their networks	• Generating potential employment opportunities for students and faculty

3.4. Novartis and UCB: Securing Options on First Class Research

In 1998 Novartis AG and the Department of Plant and Microbial Biology at the University of California at Berkeley signed a five-year agreement that grants PMB $ 25 million within this period and gives Novartis the first right of refusal for a percentage of all inventions and discoveries made in this time.

3.4.1. Novartis AG

Novartis emerged from the merger of Ciba-Geigy and Sandoz in 1996 and with its size and global reach it is one of the dominant firms in each of its core businesses. The turnover for 1999 was about $ 20,4 billion with a net income of $ 4,1 billion generated by the three divisions health care (70%), agribusiness (20%) and nutrition (10%) with about 81.000 employees. The consumer health unit includes OTC, medical nutrition and functional nutrition products. Its agribusiness division makes crop herbicides, insecticides and fungicides, pet and farm animal medicines and seeds. To focus on its less-controversial health care units, the firm has got rid of its agribusiness operations through a merger/spin-off deal with AstraZeneca forming the new company Syngenta AG, the worlds largest Agrochemical Company.

After the merger of Ciba-Geigy and Sandoz the new formed company underwent a significant internal process to review and clarify its corporate focus. Novartis was redefined as a life science company rather than a pharmaceutical company. All of the fields in which Novartis is active are undergoing a profound change in their scientific basis. Advances in biotechnology significantly reshape the whole business. Since the new scientific ground of all business units is the same the underlying rational of a life science strategy is found in the synergies expected to occur across all the areas of activity with biotechnology as a common denominator. The traditional relationship between fields could be reshaped by the opportunities offered through these developments. Novartis would be able to leverage advantages across all business units.

Most of the Novartis competitors applied a more top down strategy in implementing the life science vision – first defining themselves as a life science company and then reorganise, acquire and divest to create companies that would allow them best to realise syner-

gies between their business units (for example Monsanto and Dupont). Based on the same beliefs about the future value of its industry and its potential Novartis' decision to become a life science company was more bottom up instead. The merger was first planned to form a pharmaceutical company with interest in crop protection, seeds and nutrition. The fundament was seen in complementary businesses, gaining focus by combining R&D budgets and brand strength thereby increasing market leverage and capitalise on economies of scale. During the course of negotiation of the merger it became clear that a sole focus on pharmaceuticals contrast the development of the unification of the scientific basis of all business units in biotechnology. Due to these facts the vision of Novartis as life science giant was born. The key to competitiveness in all areas was seen to be an effective R&D. Without a strong research basis none of the goals set out would be reached.

3.4.2. The Foundation of NADII

In 1998 for both divisions – pharmaceuticals and agribusiness – large "blue skies" research centres were founded in La Jolla, San Diego, which are guided by their different goals. The belief of Novartis executives was that it would take quiet a few years for biotechnology-driven synergies between the core-businesses because of the long lead times between discovery and commercialisation of most genetically engineered products. Instead of directing considerable resources in the bridging projects between sectors value would be created best by confining them to the business units following different goals and strategies. Once technological feasibility was proven in the laboratories there would be enough time to reorganise resources within the company to fully realise the benefits of the technology, including cases that require using resources from several business units.

Both merging companies – Ciba-Geigy as well as Sandoz – have always had a strong research basis with an annual research quota of over 10% of turnover. The upcoming biotechnology represented a completely new technology for the former pharmaceutical and chemical conglomerates where competencies had to be build. Therefore, research was refocused. The biotechnology competence had to emerge beside organic chemistry, which had been the basis for pharmaceuticals as well as the agribusiness research. In the latter area the shift of focus from the targeted organisms – the cultivated plants – to the scientific discipline arrived around the mid 80s. In this time future-minded people from Ciba-Geigy founded the first research institute in the Research Triangle Park, North Carolina. However, the integration of biotechnology in the research agenda of the big multinationals took some time. The major forthcomings and innovations where located in the start-up culture of university-near basic science. The impact of the findings had to be translated first into the business language of the big companies on which the little start-up scene is heavily depending. Their infrastructure and business expertise is needed to commercialise the emerging technologies.

By the time of the definition of the life science strategy based on research excellence in biotechnology and genetics there was a basis to build on but still much work left and research strategies to define. There was no doubt to invest in research – and Novartis decided to target a lead position. The approach was to build up a full range of excellent in-house competencies and in the second place to rely on collaboration with external knowledge sources. They would fuel the internal knowledge base and create a window to the many opportunities outside the companies' borders. The foundation of an institute for basic research in genomics – business driven but also well away from every-day-business – should provide opportunities for creativity. The Novartis Agriculture Discovery Institute (NADII, renamed Torrey Mesa Research Institute (TMRI) after the spin-off of the agribusiness) was set up and plans were announced to spent up to $ 600 million by 2008 to study agricultural genomics. NADII is expected to apply genomics to generate databases that matches genes with traits and provide advanced technologies for use in the development of gene-based products. With these features this was one of the largest research commitments in agricultural genomics.

The funding for NADII was organised through the Novartis Research Foundation. Through the fund it was possible to provide considerable resources without burden the normal budget of the units. Although in parallel the Novartis Institute for Functional Genomics

(NIFG, now renamed in Genomics Novartis Foundation) was founded with the same characteristic both processes were completely independent from one another.

The next step in setting up NADII was to find an appropriate leader for the institution. It was quite clear to the decision-makers that with the institute's head much of the success or failure was predicted. With Steve Briggs, a well-known researcher from Pioneer who had been working mainly in the field of new traits, a person with best qualification was found. He has an outstanding reputation as a researcher and was well connected to the relevant research community that has been identified as one of the critical success factors for the whole project. His vision was to create internal research excellence and external collaboration through projects and strategic alliances with prominent partners to gain access to all relevant and interesting developments. For this reasons he made the decision to locate the Institute in La Jolla, San Diego.

There were mainly three centres for choice – the North Carolina Research Triangle, San Francisco Bay Area, Boston and San Diego. All locations offered a suitable climate and environment with respect to research focus and excellence, attitude and scientific community. Although some centres of excellence for this discipline exist (e.g. in Norwich or the UK), Europe was immediately dismissed since the overall climate for genetic research was not favourable. Within the process of evaluation Boston and the Bay Area were sorted out because of missing space and costs reasons. North Carolina would have offered the proximity to the business since there has been the North America location of Novartis agriculture business. In the end San Diego has been chosen because it provides several advantages as an emerging location within the biotechnology community (location with academic potential, existing research community, availability of highly skilled people etc.). Being well away from daily business in North Carolina seems to be more suitable to achieve the outset goals of the institute. Within this environment NADII could serve as a scientific platform which provides the fundamentals for the business on the whole and the companies commercial goals.

To date the institute employs about 150 researchers. Since the spin-off/merger with the agricultural business unit of AstraZeneca it fully belongs to the new-formed company Syngenta AG, Switzerland. Still under the roof of Novartis shortly after its foundation in 1998 it entered a strategic alliance with the University of California at Berkeley (UCB) respectively their department of Plant and Microbial Biology (MPB) providing $ 25 million for research at the university until 2003.

3.4.3. Development of the Alliance with the Department of Plant and Microbial Biology at the UCB

The department of Plant Biology was established in 1989 and achieved outstanding reputation for their research ever since. Just recently the department was enlarged with a division for Microbial Biology. The research focus in plant biology is: understanding the biology of plants, their development, and their responses to the environment and human impacts on the biosphere. The microbial research concentrates on microbial physiology and biochemistry, microbial development and genetics, microbial ecology and evolution, and host-microbe interactions. In total there are 30 professors pursuing basic and applied research in this areas.

Forgoing the strategic alliance with Novartis was a process of redefining and reformulating the attitude and targets of the UCB Departments in their relation with industry. In 1992 the UCB established a commission to think about possibilities and discuss opportunities through collaborations with industry. In those times there were only few and sporadic contacts between university and industry. The whole climate towards collaboration was all in all not really favourable although the university was interested in closer co-operation respectively funding from industry. One of the commission members was Prof. Wilhelm Gruissem from the plant biology department who became Dean of the Department in 1993. He took to his department the first outcomes of the commissions' work and organised an International Advisory Board on Biotechnology. The aim was to start a discussion with industry executives on ongoing research and student education as well as establishing contacts and trust between the two communities. People from relevant companies were invited to join the board and an annual meeting within the frame of "industry days" was planned. When they started

with their activities around 1993 some faculties within the department were critical about the success of such meetings between academia and industry. Concerns aroused about outselling of academics to industry. Nevertheless, the events established soon as productive dialogs between executives and researchers from industry and academia as well as university students. They yielded remarkable success from the beginning, becoming an annually jour fix for interested people. Over the years high-profile researchers and decision-makers from about 14 international companies participated on a regular basis. Encouraged by the success, the idea of transforming the Advisory Board in an instrument to raise funds from industry for the department aroused.

The official financing of the department covered an amount for the administrative costs, nearly no money for the infrastructure and only allowed to support about five aspirants in the PhD program. Since there were about 30 professors at the department the goal was to have a high-profile program, which could maintain nearly the same number of PhD students. Normally additional funds were raised through some forms of grants but they only provided short-term solutions and did not allow for a long-term planning. In 1997 a discussion about financing possibilities through the companies was launched within the Advisory Board. Looking at several possibilities it became clear soon that some form of common financing through a number of companies was not of interest for the firms. Attracting attention and willingness to spend money was the access to exclusive research carried out by the department. More substantial, long-term relationships were clearly preferred by the companies in contrast to short-term arms-length arrangements. Meanwhile, the university researchers realised that in the companies itself a lot of useful basic research and technology development was conducted. In the end the opinion prevailed to pursue a strategic partnership with one company instead of involving the whole advisory board. All professors were contacted and informed about the plans to find out who was willing to participate within the department. Most of the faculty was interested and in the end the whole department was confirmed despite of two otherwise engaged professors. Before starting negotiations with the different companies a complete plan containing general rules of the partnership, research focus, the handling of intellectual property rights, publications and so on was prepared and the actions were co-ordinated with the UCB. In 1998 the firms were contacted and within a kind of road show the partnership offer was presented to the interested firms (8 out of 14 who participated in the Advisory Board). The meetings served to clarify the expectations and position of the university as well as the companies. In case that a number of firms was willing to engage at PMB the whole thing would be organised as a competition between the firms. The companies were invited to submit a proposal based on their vision for a strategic alliance including their commitment and expectations what such an agreement could look like from their point of view. The Department would compare the proposals and decide on that basis with whom to partner.

In the end Novartis respectively NADII was chosen since they submitted an offer best suited to the departments needs and expectation. Although there were strong personal relationships between Prof. Gruissem as head of PMB and Steve Briggs, the newly appointed head of NADII, Prof. Gruissem outlined the fact that the Novartis offer was the one best tailored to the needs of the academic world. As Steve Briggs was really challenged to win the competition and due to his deep insight in the academic world he was able to design a partnership that was compelling for the academics. The negotiations were carried out between June and November 1998 and the agreement between the PMB and Novartis was finally signed the 23rd of November the same year.

3.4.4. The Agreement

The agreement finally signed by the partners mainly consists of rules and arrangements for the funding and joint work of both institutions.

To begin with, NADII committed to provide $ 25 million over a five-year period in unrestricted funds for non-targeted research. The duration of the agreement may be extended by mutual consent after the five-year period. Two-third of the money will be available for research while the rest is to cover overhead and infrastructure costs of the University and the College of Natural Resources (CNR) in which the PMB is a department. Under

appropriate confidentiality and/or material transfer agreements, proprietary tools, technologies or tangible assets may also be provided through NADII. This applies also for the NADII genomics bio-information database. They may also fund separate, standard, targeted research programs with selected faculties apart from the general non-targeted research. These research contracts will be subject to the established university research policies.

For governance of the alliance a six member Advisory Committee is in charge. It consists of three university members (Vice Chancellor for research at the Berkeley Campus, the Dean of the College of Natural Resources and a UCB faculty member not related either to PMB or CNR) and three members from Novartis Corporation (President of NADII and the two Co-Presidents of Novartis Agricultural Biotech Research Inc.). The Advisory Committee is in charge for managing the relationship and is also responsible to safeguard the public interest. The five-member research committee consists of three members of PMB (the principal investigator and two people selected by the PMB faculty) and two representatives from Novartis (again the CEO of NADII and one of the two Co-Presidents). The Research Committee selects project proposal submitted by faculty members to be funded out of the $ 3,3 million available for research. The proposals are evaluated according to principles and guidelines formulated by the faculty of PMB and monitored in case of approval.

Research covered by the agreement includes any research within the five-year period conducted by PMB faculty and staff members who signed in. This explicitly includes also research funded by government agencies. It only excluded research by department members who have not signed on to the agreement, research sponsored by other private for profit organisations and any research funded by a contract that would be violated by this arrangement. That means that all in all most research at PMB is subject to the agreement.

The research results are presented at an annual scientific meeting. The university owns the research results but anything that contains NADII proprietary information can't be published or presented without the consent of NADII. Although they acknowledge that the UC environment is open, the university is to make best efforts to maintain the secrecy of proprietary information (which is defined as anything written or said from one party to another that the first party says is proprietary; this can occur up to 30 days after the communication occurred). Copies of the results are provided to NADII for free and may be transferred within the whole company. Potential publications or disclosures of results to anyone not participating in the agreement must be approved by NADII 30 day's prior. In case of patentable subject matter detected by NADII, publication can be delayed up to 90 days in order to request that a patent is filed either by the University or NADII.

The university generally holds patents except the research has been carried out (1) through university and NADII employees without using University facilities or (2) through NADII employees on their own using University facilities. The UC has the obligation to inform NADII of any patentable discovery made by anyone who signed on to the agreement. NADII has the right to pick a portion of all the patentable discoveries made by the covered research according to their portion of research funding (about 1/3 of the whole research budget each year). They get the first right to negotiate an exclusive, royalty bearing license to market the invention, which must be exercised within 180 days of the patent filing. In case that the invention was made under use of the generics database of NADII they get an irrevocable, royalty-free, nonexclusive license.

Either party with one year's notice may terminate the agreement. Both parties are reliable to act in good faith and make best efforts not to enter in conflicting situations. All faculty members who receive research contracts or grants or any other gift from the Novartis Corporation had to disclose any financial interest they may have had in the firm. The UC as such is further committed to their goal to provide intellectual property rights for the public benefit and encourage the broad utilisation of the results of university research.

Not surprisingly, there has been a considerable debate and student's protests (mainly from other departments and colleges but not the CNR or PMB itself) upon the signing of the agreement. Concerns about the outselling of university research to private investors, influencing research, delaying unfavourable results and corruption of the aims of research were widely discussed. To day, the alliance has established to the benefit of everyone involved. All project proposals submitted to the Research Committee have been approved. There were no

reports of Novartis trying to influence the department's research agenda. No project has been stopped by NADII. In contrast the additional funds give the opportunity to start projects that have not been pursued through normal funds since the risk is seen to high – meanwhile forgiving the return opportunities in case of success.

3.4.5. Main Features and Assessment

The efforts in building up closer relations and partnership with industry undertaken by the Department of Plant and Microbial Biology at UCB yielded considerable success. Having a closer look one might be surprised how fare the partners have compromised in areas that would somehow represent "holy grails" for both institutions. However, this success was not only due to favourable conditions and luck. It depended on some critical factors that enabled a working partnership with industry. The main success factors can be summarised as follows:

- Outstanding research performance and therefore a visible reputation within the research community;
- Building up a basic trust and a common language between university and industry;
- Personal engagement and vision combined with pragmatism;
- Shared aims within the university department that allowed to present and act as a unit;
- A structural framework and clear policies, clearly defined expectations, visions and positions for the relationship;
- Balancing university's and industry's interests;
- Personnel networking and relationships;
- Using the window of opportunity.

Without anything in exchange no one can expect to succeed in the marketplace. For a research and education institution that means an outstanding visible performance in a valuable field is the prerequisite to enter in collaboration with a private company that is expected to fund the institution.

The agreement about the strategic alliance between NADII and PMB is not the outcome of a single action. It wouldn't have been possible without the numerous efforts of the institute during the 90s. Through the Advisory Board on Biotechnology and the yearly events contacts have been established between the scientific and the business community. These contacts opened up the chance to meet relevant people, to derive in face-to-face contacts a common basis for understanding and interaction. The persons as well as the institutions were offered an opportunity to make experiences with each other and build up a picture of the partner and expectations through time. An important fact may be that at the beginning the mutual expectations from both sides were not set at such a high level that they inevitable couldn't be met. However, the establishment of a fundament of mutual trust on both sides significantly contributed to the later alliance foundation and partnership.

Personal engagement and involvement of the people in charge mainly drove the occurring activities and events at PMB. There was not much experience with establishing industry contacts and relations the formulation and implementation of a coherent vision depended heavily on the creative and managerial capabilities of the people involved. Not all faculty members were convinced of the benefits close industry relations might yield and some were really critical about that approach. Likewise, scepticism of industry towards joint work with university researchers has to be overcome. Heavy work of convincing people and formulating a coherent vision that balances the interests of all participants was needed. Especially in basic research institutions co-operation with industry is sometimes seen as selling the Holy Grail to the devil. Academic vanities or either pure ignorance hamper the exploitation of opportunities lying within such collaboration. The establishment of industry relationships therefore needs promoters with patience and the ability to enforce developments.

Although there were lots of discussions ongoing within the department at last nearly the whole faculty committed themselves to a mutual vision and goal. 28 out of 30 professors

supported the actions undertaken by their head and signed on to the agreement formulated in 1998. The department appeared to outsiders as a unity represented through each of its members. This commitment enhanced the value of a potential alliance to a great extend since many areas of interest could be included in the arrangement. In addition, it signalled a professional manner to the potential alliance partners.

The academics clearly defined their aims, evaluated their own position and the expectations of the potential industry partners. The possibilities to raise funds from industry were not restricted to a single line of action but derived from the constant dialogue in the forgoing activities with the expectations of industry. The researchers were able to involve the business attitude in their own way of thinking without compromising on their creditability and their public mission to serve for the community and not a single company. The open-minded attitude allowed thinking in different directions and looking at a set of opportunities. One the other hand side the topics where no compromise could be accepted (e.g. the money had to come without restrictions, the framework and policies for industry-collaboration established and enforced by the University of California at Berkeley) are clearly marked. The approach was made with a well-described conception addressing all relevant areas of discussion not excluding the really critical ones like intellectual property rights, confidentiality and publications. The ability to compromise was signalled where appropriate and clear statements were made concerning points of fixed expectations. This led in the end to a well-balanced arrangement combining the strength of both partners, securing potential benefits occurring out of the partnership for all participants further nurturing the climate of a trust-based partnership.

At the time the conception was worked out at PMB Steve Briggs became CEO of the Novartis Agricultural Discovery Institute. Since he knew Gruissem for a long time and both had worked together on several projects the personnel relationship had strong influence on the final decision. The existence of strong informal networks and relations is increasingly seen as a critical factor in co-operation theory when it comes to explanations for partner choice. On the other hand side Gruissem points out that Brigg's intimate knowledge of the academic world helped to formulate a partnership proposal that suites the expectations of the academics best and beat the competitors collaboration proposals (in some cases divergent expectations of the framework for intellectual property rights exists, in another one the industry partner was only willing to cooperate with some of the faculty of the department). Maybe if he hadn't known Gruissem so well, he wouldn't have been that much engaged in formulating an outstanding proposal. After the initial decision for a co-operation with NADII, Briggs and Gruissem were the two main negotiators of the contract together with either sides' lawyers. Due to their personal relations they might have been able to achieve compromises on critical points where in other constellations negotiation might have had a hard time or even failed.

Despite all the mentioned facts one has to consider that at the time the agreement was initiated and negotiated a unique window of opportunity opened up. The leading Agribusiness-companies were very active with building up research capabilities in genomics, sequencing of genes etc. It became clear quite soon that they had to collaborate with external university partners, which could broaden the basis of expertise to leverage the information and set maximum value out of their own activities. The realised need for partnership strongly supported the process initiated by PMB.

In the end a unique agreement was achieved. It is worth mentioning that the partnership with NADII respectively Novartis had no influence on the relation to other firms. The project-based work with other industry partners continued and grants were given like before. The whole process of biding for the ideas of the department has been seen as a fair offering to everybody that was willing to engage. Everybody got a chance and could have done it. As Novartis did it the fact was just accepted.

Benefits for the Participants

Industry Partner

- **Superior access to skills and competences**
- **Exclusive access to new scientific results, which cannot easily be re-produced in an industrial setting**
- **Securing relevant education for junior executives through enabling incorporation of latest methodologies and technologies in education**
- **Leverage company R&D efforts since not only results from directly funded research are exclusivly accesible**

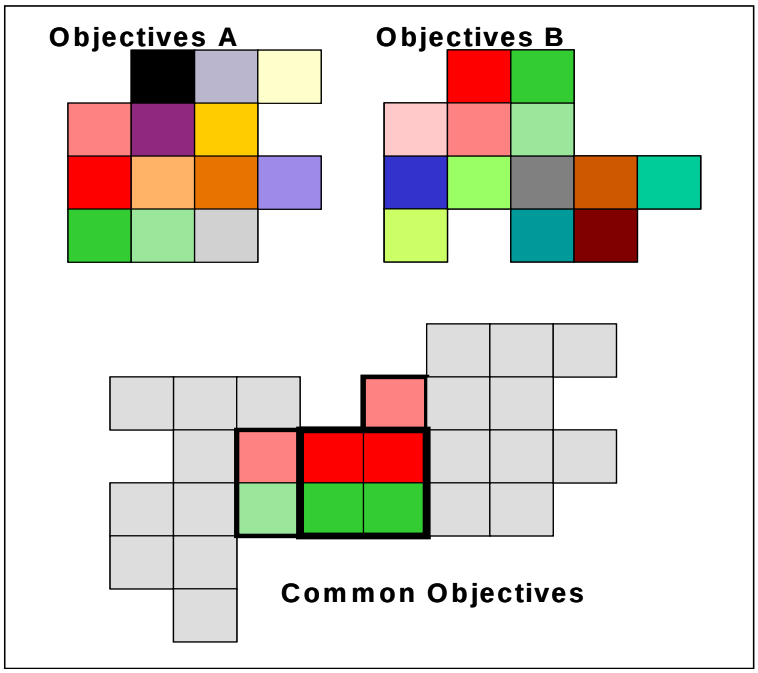
University Partner

- **Access to funds for salaries and research materials for students, postdoctoral researchers and staff scientist**
- **Funds for additional more risk but also more return bearing projects**
- **Access to outside skills and knowledge like huge databases that cannot be build by a university on their own**
- **Improving potential employment opportunities for students and faculty**

4. Lessons learned: Determinants for successful Industry-Academia Collaboration

4.1. Challenging Opportunities for Win-Win Situation

Figure 9: Identifying common Objectives



Looking at the described cases, the collaborative efforts have clearly led to a win-win situation creating benefits for all participants without forgetting their primary objectives. There are considerable possibilities to join forces to achieve results valuable for all partners. The intention is not to suppress differences and willingly overlook them but to accept each other's objectives and search for winning combinations. The vision of each partner has to be clarified followed by a search for reciprocal objectives and balancing interests.

Industries Advantages

In recent times companies are confronted with a fierce innovation competition, a multitude of competencies needed and diversified competence sources. Inhouse maintenance of all needed capabilities is often neither possible nor wanted. Especially costly basic research is reduced although scientific advancements are still the basis of the innovation pipeline in technology driven industries. Collaboration with universities offers an opportunity to overcome the dilemma. They can provide the following advantages:

- Getting access to unique expertise and facilities;
- Getting access to technology and attractive skills not available elsewhere and not easily reproducible in an industrial setting;
- Leverage company R&D by accessing other resource bases with respect to knowledge and finance;
- Accessing ideas for long-term pay-off by enforcing serendipity at the interfaces between people and at the borders of disciplines;
- Accessing potential employees within the students and faculty community.

University Advantage

As described, private companies and universities as well benefit from collaboration. In correspondence with their primary vision and mission of supplying valuable research results to the public they can enhance their capability by:

- Getting access to expertise and resources available from industry and sometimes not reproducible in an university setting;
- Quantitative enlargement of university research securing the necessary critical mass;

- Getting exposed to practical problems, discovering and guiding research and securing relevance of addressed topics;
- Using results for education; deliver the latest methodological and technological knowledge to students and postdoctoral staff;
- Giving additional meaning and purpose to the institutions work.

The benefits have been proved by the investigated collaborations between private companies and university departments. They all resulted in valuable benefits supporting the individual organisation objectives. However, despite regarding the tremendous opportunities risks involved for the participants should not be neglected.

Company's resources are lost if they cannot capitalise on the outcome of the collaboration. This may be due to two facts: the work is not leading to any economically valuable results or the incorporation of results in the business cannot be achieved. Both can be prevented by a professional collaboration management, which secures as much as possible an outcome valuable for the company. This involves continuous attention and a continuous change management since context and external condition may change over time. Another important risk for companies is the loss of proprietary information or weak approbiability regimes respectively. The university as an open environment is not able to guarantee that information and knowledge resides only with authorised persons. This inherit risk is most important for companies active in industries where exclusive ownership of IPR are of major importance. However, considerable efforts may reduce it to a tolerable extend.

Universities are most often concerned with the loss of research freedom and dependency on private companies. The companies might take to much influence on the research agenda. The risk is the higher the less concrete the research objectives and conditions are defined. Thus, keeping identity and independence in the whole process is necessary. Again, professional collaboration management is needed. Independence also refers to the overall funding situation. Although industry funds are appreciated universities should rely on a balanced mix securing existence and research work if the corporate money is shortened. The risks of unforeseen termination of collaboration are also important with respect to changing economic situation of the industry partner. The first budgets to be cut are normally found in R&D. With decreasing budgets costly external partnerships may be terminated before the reach their objectives. The university and especially involved PhD students may be left with unfinished work and no money to go on. The willingness of industry to engage in university collaboration will always vary with economic development.

Nevertheless, conditions can be influenced and measures can be taken to reduce risks and secure success of collaborations. How to do so and therefore handle critical areas is addressed more detailed in the next section.

4.2. Success Factors and Recommendations

4.2.1. Vision and Complementary Objectives

- **Clearly define own goals and positions.**
- **Evaluate the existence of complementary positions.**
- **Develop a shared vision and align strategic goals.**
- **Be willing to truly accept differences.**

The winning combination and a main factor of success for almost all long-term collaborations are complementary competencies and a joint vision. They provide the incentives to engage in the relation and the ability to compromise on points of minor importance.

All partners need to have a clear understanding for themselves what their intentions and visions are. This refers particularly to the strategic goals of the participants:

The ultimate objective from the economic and business point of view is a successful product or sellable service. The major challenges are to turn scientific know-how into successful features for future products. Time and cost efficiency are of top importance.

- The scientific and academic ambition is focussed on understanding mechanisms and the underlying factors. New and correct explanations of processes and phenomena are the basis for publications and scientific merits.
- The political objectives are different again. Regional economic prosperity, new employment opportunities and scientific fame add to the attractiveness of the location and also of the leading politicians.

If these different driving forces can be aligned into a mutual strategy the foundation exists to define the common objectives and the benefits of the collaboration. This shared vision eases the definition of the type, nature and purpose of the relation, its scope and time frame. In all four case studies the different points of view were present. The actual success factor turned out to be that each party saw enough benefit and chance to reach its own goal. Due to this fact they could accept that the other parties could gain some additional benefits outside their own scope. Instead of fighting over the differences they joint forces to reach a common vision and accepted that there were complementary objectives for the others. On this basis compromises allowed each partner to follow its specific aim while leveraging their own capabilities through the partnership.

Bertelsmann accepted the academic goals of the MCM Institute and the University St. Gallen even though there are several aspects, which were not in line or of no interest for Bertelsmann and its economic goals. On the other hand, the University St. Gallen accepted a strong link to an economic institution even though this was not completely in line with the pure academic point of view.

AT&T and its predecessor Olivetti accepted that the vision of the researchers at the University of Cambridge were not only of much longer term but also aimed at fields which may never be within the scope of their business. The economic sponsors accepted that some results of that broad research would be used and marketed outside their own interest. On the other hand the state-owned University of Cambridge accepted this kind of unusual link with business organisations.

4.2.2. Attitude: Competent, Eager, Innovative and Learning

- **Support and demand personal competence, eagerness and initiative.**
- **Create an innovative culture and motivating organisational set-ups.**
- **Promote and sustain learning of all parties and participants.**

Attitude refers to individual and organisational characteristics and behaviour. Beyond an overall open-mindedness towards interaction and exchange with other parties a distinct willingness to take action and succeed is needed.

In all four successful cases there was eagerness and passion to realise the developed vision and leverage own capabilities by joining forces with external partners. Driving persons were able to think beyond common lines, to question traditional practices and to develop innovative modes of collaboration specific to the situation and partners. The common attitude was to explore new territories for different reasons not only with respect to the research topic but also in approaching new organisational structures. A pro-active approach to encourage academic people to engage in industrial collaboration supports individual initiatives. In the traditional system, incentives to engage in technology transfer and to interact with the business sector do merely not exist. Academic merits are normally earned in the scientific community. Publications, educational efforts and students passing their exams measure faculty. Establishing incentives and recognition for collaborative efforts are needed to encourage academia.

High competencies in their respective field combined with the will to continuously innovate and learn from experience were equally essential. A prerequisite for private companies as well as universities is to assess if the potential partner has the competencies to realise the pursued vision. At this point, research and/or education record comes in: Private companies approach universities and departments, which have proven capabilities and therefore gained an outstanding reputation in their field. This is often the only possibility to predict future success. They are not looking for the second best but for the best in class. Thus, for universities to attract partners from private industry excellent performance and visibility are essential. Likewise, universities try to combine their competencies with the industrial ones, which seem best suited for their goals.

Pursuing long-term collaboration is increasingly seen in true joint learning instead of providing funds and defining the research goal. The successful cases point to the important fact that the participants define their relation as a learning possibility and mutual exchange. They are eager and willing to learn from each other. Knowledge sourcing is not seen as a one-way road from academia to industry and vice versa. The knowledge creation process is a joint one, which enhances innovation capabilities in the long run.

In all cases one or two major person had considerably influenced the building process and the performance of the collaboration with their drive and engagement. Looking at Bertelsmann and the MCM Institute without the efforts of Wössner and Schmid there might not be an Institute for Media and Communication Management. The same applies to the UCB/Novartis collaboration. Gruissem and Briggs were able to negotiate a distinct contract, which satisfies the interests of both partners. All arrangements are constructed to facilitate the exchange and foster joint learning. A very special case is AT&T Laboratory where the processes and structures operationally evolved without formal arrangements under guidance of Hopper.

4.2.3. Long-term Commitment and Accountability

- **Research culture and approach must allow for long-term commitment from all sites.**
- **Implement efficient monitoring and review processes not killing motivation and causing an administrative bulk.**
- **Buffer exogenous shocks that might occur during the collaboration.**

A long-term commitment is necessary for good research for third and fourth generation "products". It allows planning for long time horizons needed to obtain valuable results. The academic environment is adapted to this kind of long-term research. From a company's perspective engaging in long-term agreements with university researchers needs a technological strategy that is sufficiently broad and long-term to consider partnering beyond solving specific problems and meeting regulatory requirements. Providing windows on emerging technologies and tracking the development of new ideas, which could make the company's present key platform technologies obsolete should be included in the collaboration. This in turn encourages researchers to dedicate their efforts since this is in line with their own goals. Hence, for this kind of collaboration, companies with a distinct research culture, size and resources are better suited than SMEs. However, there is the danger that long-term commitments lead to complacency and loss of research focus. Therefore, some form of monitoring and controlling has to be installed.

Accountability refers to two points: following and reporting progress of research work without suffocating it in an administrative jungle and – from another perspective – the preparation for exogenous shocks. The first aspect emphasises that trust is an important factor in managing and executing collaborations. The successful Universities were able to prove to their industrial partners that continuously monitor research progress on their own is a suitable form of self-control. They made the progress visible to their sponsors without allowing them to interfere with short-term demands. The review meetings of AT&T and Novartis at their respective partner universities have more the character of brain storming and motivating events rather than de-motivating control exercises. Despite this pro-active view the partners find ways and means to make tough decisions when needed.

Exogenous unexpected shocks are quiet common in the company's sphere. Mergers, acquisitions, reorganisations, economic fluctuations and downsizing are just a few. Although the university seems to be more stable their may also be interruptions like bidding away of key faculty members or administrative turnover. Since these changes may not all be anticipated when setting up the collaboration more general strategies might help to buffer these shocks. Most relations are developed through key persons in the organisations. Establishing multiple links and build up several tasks might reduce the risk of unforeseen termination. A larger number of linkages between different people at different levels increase the support and visibility of the relation within the university and the company. Disseminated valuable results may justify the continuation in case of major chances of context factors.

The collaboration between Novartis and UCB has seen two major changes up to now. Novartis' Agribusiness has been merged with AstraZenecas Agrochemicals creating the new company Syngenta. Secondly, Gruissem left the department. Since the agreement lasts for a five-year period and involves the whole PMB Department these events did not stop the partnership. When it will come to negotiations in 2003 about further collaboration the fact that the funds came from Novartis Research Foundation residing with Novartis may influence the outcome. Under the present arrangement the funding would directly affect the earning statement of Syngenta.

4.2.4. Window of Opportunity = Be prepared and On-Time

- **Search for and establish suitable opportunities for exchange and interaction.**
- **Initiate personal linkages and networks, foster communication.**
- **Prepare "academic" and "industrial" for windows of opportunity.**
- **Use environmental monitoring to detect favourable circumstances.**

Windows of opportunity may be defined as short periods in time when circumstances and conditions favour a specific type of action. Such windows of opportunity are not only a matter of accidents and incidents. One has to be prepared to act when the chance occurs.

The cases of Bertelsmann, Medtronic and Novartis showed that interactions did start long before the actual contracts were negotiated. Long periods of interaction and contact have preceded the final agreements. Long-term research partnership seems to develop out of personal contacts and networks, consulting relationships, current or prior research relationships and contacts with graduate students who may have entered the business community or become faculty. All these interactions provide opportunities to develop a common language and mutual understanding of each other. Business sector and academic world have fundamentally different cultures that manifest in divergent goals, time horizons, languages and assumptions. Quarterly goals are not existent in the university while hypotheses and models are words rarely used in practice. Incentive structures and measures are totally different. In order to be able to agree on a joint vision, to commit considerable resources and to compromise on controversial issues the involved parties must understand the main driving forces within the partner's organisation. This can be achieved in continuous interaction. Mutual trust is established thereby. In addition, contacts and interaction may initiate new thoughts what a potential partnership could look like. The own position and expectations related to collaboration could be shaped and refined. That means continuous efforts have to be made to be prepared in terms of understanding the partner.

Novartis and UCB had known each other for several years. They had experience in similar projects and gathered knowledge about each other. The activities initiated at UCB to establish closer interactions with the business sector resulted in a mutual understanding. When UCB went out to find the best industrial partner one major argument was the fact that the heads of the two organisations could prove and were convinced that the other was the most competent and innovative one. The same arguments fuelled the decisions of Medtronic, AT&T and Bertelsmann.

Closely related to that point is environmental monitoring to detect windows of opportunity. Only companies and Universities who are looking for such opportunities are able to identify them and make use of them. The strategic business planning for economic organisations and the process of focusing the academic research at universities have to be constantly updated in order to be on time with such decisions. Gathering accurate and continuous information about changes in the institution's external environmental is, therefore, a prerequisite. This scanning may also determine the usefulness of a particular research activity.

The University of St. Gallen had started their activities and was looking for growth when Bertelsmann was able to make a commitment on a longer time basis. The Universities around the area of Lausanne including the University Hospital were already in the process of emphasising life science as part of their program when Medtronic was looking for a new European headquarter.

4.2.5. Understandable

- **Develop support for partnerships in the academic and institutional culture.**
- **Communicate partnership agreements on time and openly.**
- **Be aware of public opinion and political concerns.**

All actions and engagements are embedded in their specific context and environment, which set the rules what is appropriate and what is not. Sociologists refer to social control mechanisms, which encourage or discourage people since they reward or rebuke people for their actions. The special culture contains and formulates formal and informal rules.

Academics are dedicated to finding the true and objective answers to questions of general concern. Partnerships with industry are often viewed as corrupting this mission. Concerns about commitment conflicts are strong. Members of the university community may interpret these partnerships as a form of disloyalty to the university – and, possibly, towards the larger field of public research and higher education. It is therefore not surprising that in the case of Bertelsmann's engagement in St. Gallen and the Novartis collaboration with UCB there were protests and signs of fear from different groups. Were such co-operations acceptable for universities? To answer such questions, special attention must be paid to communicating and explaining the nature of the partnership and the agreement. University members mustn't engage in partnerships that may hurt the institution, thus decreasing or eliminating the institutional support. In addition, clearly stating what are the benefits of a research partnership and what risks and costs are involved helps to convince the environment. In both cases cited it was possible to explain the reasons and the mechanism behind the joint projects.

Scepticism related to collaboration with academia is present in the private company sphere as well. The most common fear is to spend money without getting valuable results that can be commercialised. University researchers are perceived with little focus and missing entrepreneurial spirit. Within the companies not only researchers but also managers have to be convinced of the opportunities and benefits of industry-academia collaboration. Therefore, an understanding of the nature of basic or long-term orientated research respectively is needed to be able to assess the chances/risks, their impact and possibilities. Likewise, industry has to be convinced of the commercialisation capabilities within the university.

Concerning new technologies and developments, e.g. biotechnology or media and communication, sensitivity is extremely important since public fear and interest is large. This concerns to larger extent politicians who may be critical factors in expressing and influencing public opinion. Thus, a continuous open dialogue with politicians is needed. The point addressed here is the attitude towards new technologies and the open-mindedness of society as such. It may have strong influence on pursued research directions and partnerships

4.2.6. External Conditions

- **Provide good, reasonable (not excessive) "political infrastructure"**
- **Provide clear rules how to handle Intellectual Property Rights.**
- **Minimize administrative procedures and delays.**

External conditions such as tax rates, quotas on foreign working permits, infrastructure support and appropriability regime always played a role in the decision where to set up a facility or research partnership. In the four cases all partners admitted that such factors played a role but they were not as decisive as they are usually reported in the media.

Since there has much been written on taxes and other legal conditions emphasise should be on handling intellectual property rights and administrative involvement in setting up long-term partnerships. From legal view universities are not obliged to claim IPR for their own use. Thus, the handling takes quiet different forms. The University of Cambridge in fact does not care at all about IPR. UCB claims all exclusivity for its own. Research staff is obliged to sign an agreement, which consists of the statement to immediately inform the Licensing Office of any invention and disclose. However, for the companies it is of importance to get research results exclusively whether they claim the IPR from the beginning or get an exclusive licence if the patent remains with the university. It is of importance that clear rules concerning the handling of IPR exist; whether they are totally loose or in comparison really tight; what matters is consistency. Confusions about that issue seem to discourage companies since this causes delays and difficult negotiations.

In all cases it was reported from company executives and university members that fast administrative processes within the university and with legal authorities clearly put them in favour of other locations and organisations. Fast negotiations and approvals gave the whole process of setting up the collaboration considerable pace in line with the company procedures and structures. Decisions made could be realised on time.

To conclude, all parties involved stated that there were even more advantageous locations with better external conditions. The ultimate decision was more strongly influenced by the quality of partners rather than their physical location.

5. From Sponsorship to Partnership

With the advent of the knowledge society and the changing conditions for universities and companies, the relations between the knowledge-producing organizations and society are being altered. Knowledge is identified as the prime motor for economic growth. The system of knowledge production is characterized by:

- Transdisciplinary; a large variety of knowledge producing organizations is necessary;
- Collaborative partnerships involving researchers and practitioners in a dialogue;
- Duality: those with great capabilities for transforming academic knowledge into solving practical problems or using these problems as a starting point for developing new theories are the most important knowledge producers. Intellectual stimulus and primary reference is to be found in practitioners providing problems.

These observations lead to the conclusion that the relations between academia and the business sector will increasingly emphasize knowledge jointly created in collaborative processes instead of merely transferring knowledge created by academia to practitioners. Therefore, not sponsorship but real partnership is needed. The aim of this paper is to show how such partnerships can be created, how success factors may be shaped and barriers can be overcome in order to encourage academia and industry to enter into such partnerships.

Concerning the university perspective there are some points to add to complete the picture.

(1) To keep their identity in partnerships with industry it is essential to diversify funding sources. The use of traditional funding such as research grants and corporate money has to be mixed. Therefore, legal authorities are advised to provide a continuous research policy, which allows strategic planning without critical dependency on corporate engagement. One has to consider that corporate engagement is very likely to depend on the economic situation of a company and may vary significantly over time. Such stop-and-go situations have to be avoided.

(2) To balance interests and provide consistency, researchers should insist on the academic privilege, which might imply that industrial partners have to respect the researchers independence and shouldn't always expect tailor-made results completely fitting their mission. Path-breaking discoveries and serendipity often occur as a side product of mission-orientated research or at the interfaces between research fields. Further investigation and exploitation of results initially not being the focus of research must be possible.

(3) Last but not least intense collaboration with the business sector is clearly limited to a distinct set of disciplines. Natural science and sectors like telecommunication, biotechnology, medicine, computer science, media and the like are suited for external funding and justify financial efforts for the private sector. Others, especially the humanities, will probably never get similar private long-term funding. They will always be completely depended on public interest and funding as well as social engagement.

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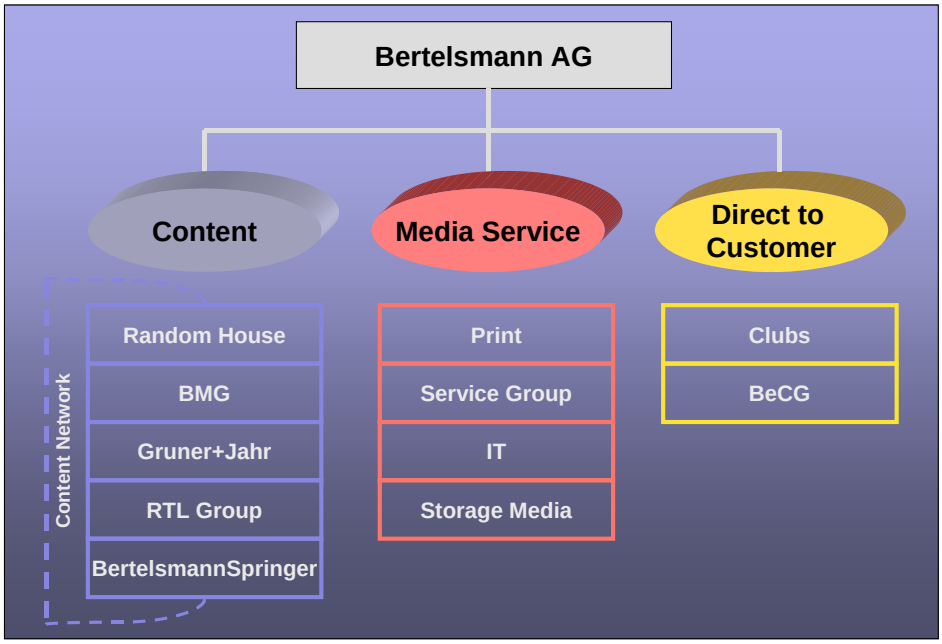
ANNEX 1: BERTELSMANN AG

Figure 10: Facts and Figures Bertelsmann AG

Consolidated earning Statement (Financial year ending 30.06., in millions of € except per share and employees)	2000	1999	1998
Consolidated Revenues	**16.524**	**13.289**	**11.738**
Book	4.223	4.253	3.342
Gruner+Jahr	2.931	2.755	2.622
BMG	4.778	4.166	4.044
Arvato	2.239	1.940	1.723
CLT-UFA (now incl. in RTL Group)	1.665	3.211	3.063
Multimedia	477	250	160
Bertelmann Springer	684	462	365
Cost of materials	5.171	3.967	no data
Royalty and license expenses	1.912	1.656	no data
Personal costs	**3.755**	**3.201**	no data
Depreciation of intangible assets/property/plant/equipment	946	570	no data
Other operating expenses	5,154	4,164	no data
Income on investments	37	444	no data
Interest expenses	190	142	no data
Total cost and expenses	11.958	13700	no data
Earnings before income tax	1.100	897	no data
Provision for income tax	428	432	no data
Net earnings	**672**	**465**	no data
Net earnings as % of net sales	4.1%	3.5%	4.9%
Earnings per share – basic	-	-	-
Earnings per share – diluted	-	-	-
Employees	71.289	64.839	57.807
Net cash provided by operating activities	**1.291**	**909**	

Source: Bertelsmann Annual Report 1999.

Figure 11: Corporate Structure



Source: Bertelsmann.

ANNEX 2: NOVARTIS AG / SYNGENTA AG

Figure 12: Facts and Figures Novartis AG

Consolidated earning Statement (Financial year ending 31.12., in millions of CHF except per share and employees)	2000	1999	1998
Net Sales or Revenues	**35 805**	**32 465**	**31 702**
Pharmaceuticals	17.856	15.430	14.501
Generics	2.108	1.992	1.529
Consumer Health	6 395	5.570	4.739
CibaVision	2.085	1.632	1.505
Animal Health	1.083	927	1.036
Discontinuing Agribusiness	6.693	7.056	7.434
Cost of products sold	10.242	9.822	10.052
R&D expenses	**4.657**	**4.246**	**3.906**
% of sales	13%	13%	12.3%
Marketing & Distribution	10.945	9.561	8.790
Administration & General Overheads	2.078	1.493	2.034
Operating income	7.883	7.343	6.920
Net Financial Income	1.091	793	759
Income from associated companies	98	383	239
Income before taxes and minority interests	9.072	8.519	7.918
Provision for income tax	1.862	1.860	1.882
Net income	**7.210**	**6.659**	**6.010**
Net income as % of net sales	20.1%	20.5%	19%
Earnings per share – basic	110	100	91
Earnings per share – diluted	110	100	91
Employees	67.653	81.854	82.449
Net cash provided by operating activities	**7.612**	**6.893**	**5.853**

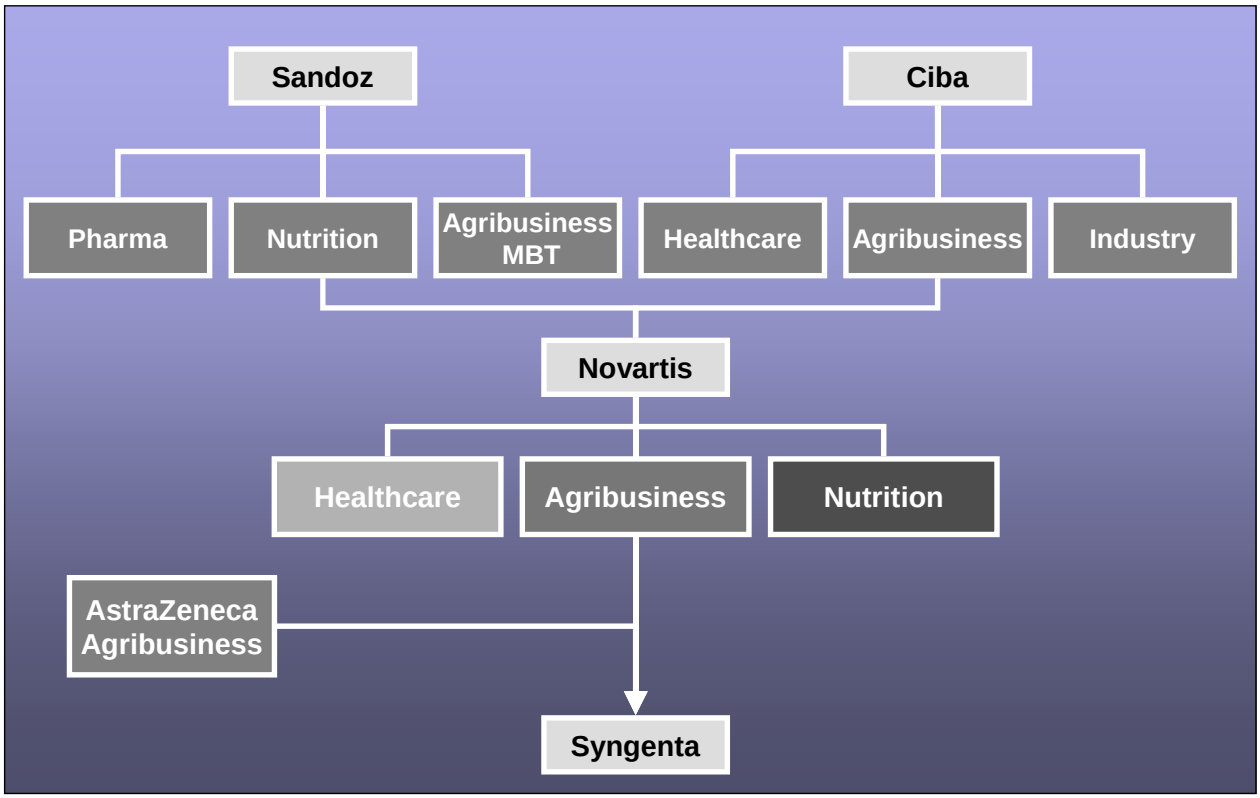
Source: Novartis SEC report 20-F (2000).

Figure 13: Facts and Figures Syngenta AG

Unaudited Pro Forma Combined Income Statement (in millions of $)	**2000** year ended Dec 31	**1999** year ended Dec 31
Net Sales or Revenues	**6.846**	**6.997**
Crop Protection	5.888	6.050
Seeds	958	950
Cost of products sold	3.510	3.580
R&D expenses	**745**	**760**
% of sales	7.9%	10.9%
Marketing & Distribution	1.295	1.411
Administration & General Overheads	603	921
Operating income	693	325
Net financial expenses	243	300
Income from associated companies	0	7
Income before taxes and minority interests	450	32
Provision for income tax	228	82
Net income	**222**	**(56)**
Net income as % of net sales	3.2 %	-0.8%
Employees	no data	20.800
Net cash provided by operating activities	no data	no data

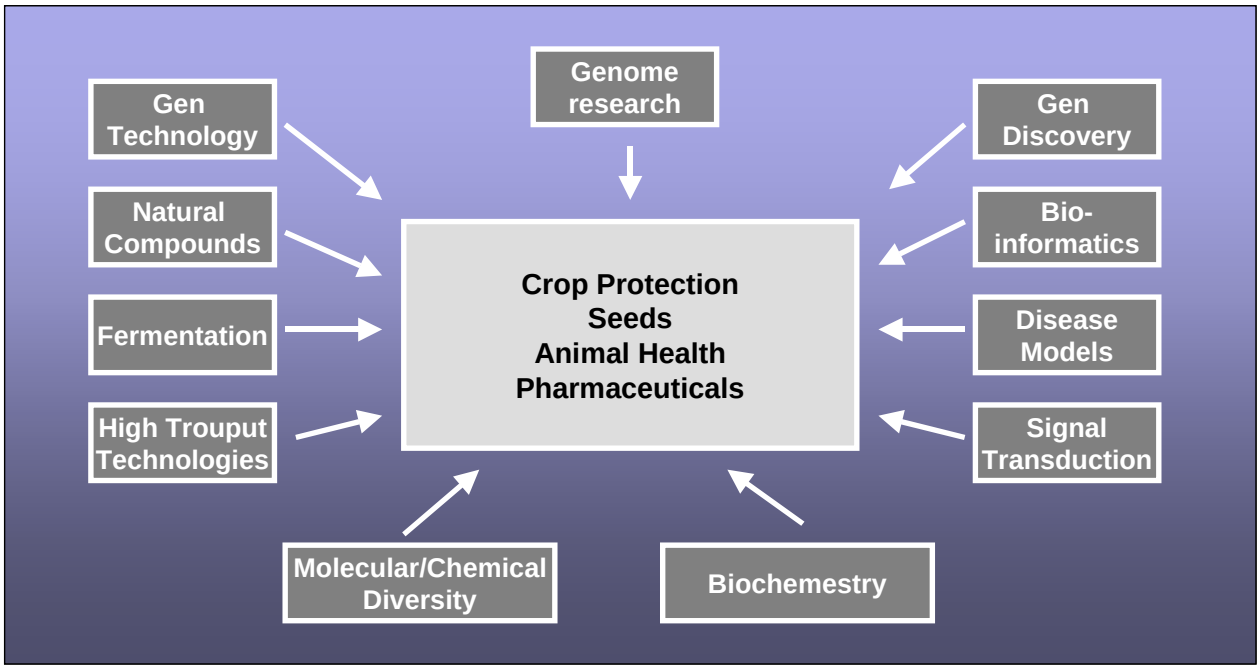
Source: Syngenta (2000).
The financial information was prepared in accordance with U.S. pro forma accounting rules and is based upon the historical performance of Novartis agribusiness and Zeneca agrochemicals business as separate entities.

Figure 14: The Novartis Merger



Source: Novartis.

Figure 15: Synergies in Life Science Research



Source: Novartis 2000.

ANNEX 3: AMERICAN TELEPHONE &TELEGRAPH CORP.

Figure 16: Facts and Figures AT&T Corp.

Consolidated earning Statement (Financial year ending 31.12., in millions of $ except per share and employees)	1999	1998	1997
Net Sales or Revenues	**62.391**	**53.233**	**51.577**
Consumer Service	21.972	22.885	23.690
Business service	25.102	22.706	21.520
Wireless services	7.627	5.406	4.668
Broadband	4.871	-	-
Other and Corporate	2.819	1.321	888
Costs of service and products sold	29.071	25.823	26.388
Selling, General and administrative	13.516	12.770	14.371
Incl. R%D expenses	**550**	**513**	**633**
% of sales	0.9%	1.0%	1.2%
Depreciation and other amortization	6.138	4.378	3.728
Amortization of goodwill, franchise costs and other purchased intangibles	1.301	251	254
Net restructuring and other charges	1.506	2.514	-
Total cost and expenses	51.532	45.736	44.741
Operating Income	**10.859**	**7.487**	**6.836**
Equity loss from Liberty Media Group	2.022	-	-
Interest expenses	1.651	427	307
Other income (expenses)	(501)	1.247	443
Income of continuing operations before tax	6.685	8.307	6.972
Provision for income tax	3.257	3.072	2.723
Income from continuing operations	**3.428**	**5.235**	**4.249**
Income (loss) from discontinued operations	-	1.163	166
Net income	**3.428**	**6.398**	**4.415**
Net income as % of net sales	5.5%	12.0%	8.6%
Earnings per share – basic	1.77	1.96	1.59
Earnings per share – diluted	1.74	1.94	1.59
Employees	147.800	107.800	130.800
Net cash provided by operating activities	**11.635**	**10.217**	**8.501**

Source: AT%T Corp. Annual Report 1999.

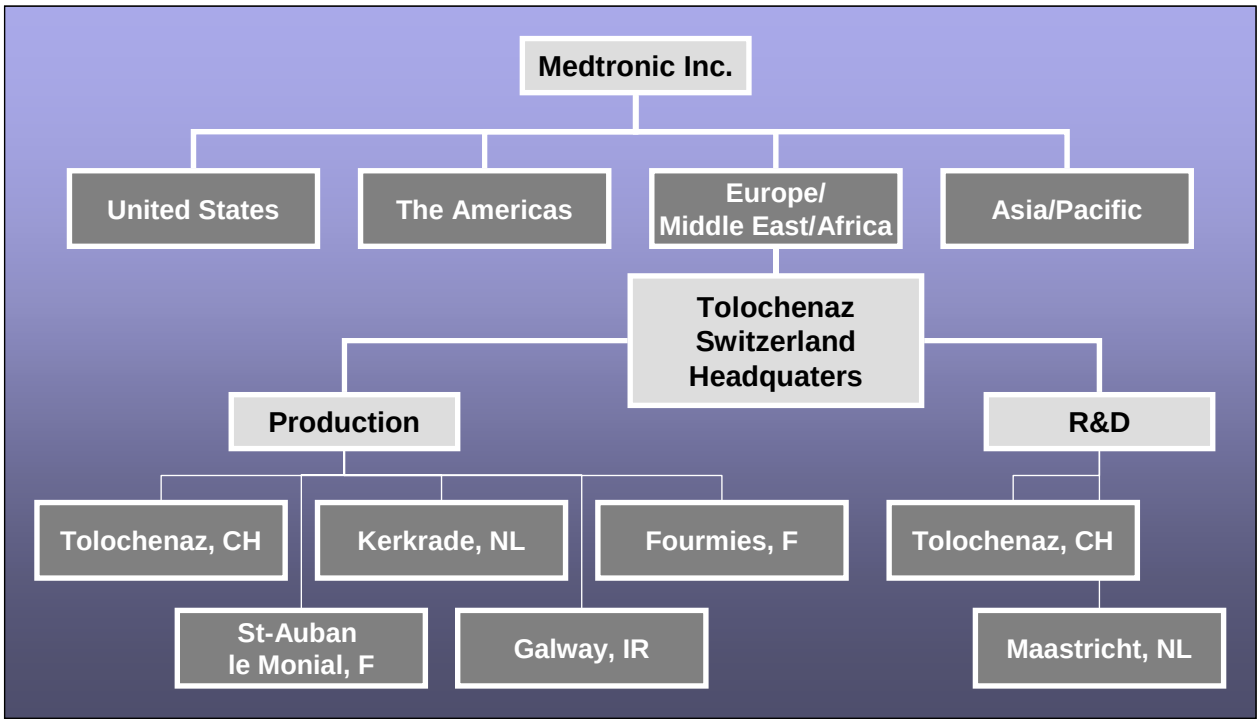
ANNEX 4: MEDTRONIC INC

Figure 17: Facts and Figures Medtronic Inc.

Consolidated earning Statement (Financial year ending 30.04., in millions of $ except per share and employees)	2000	1999	1998
Net Sales or Revenues	**5,014.6**	**4,232.4**	**3,423.1**
Cardiac Rhythm Management	2,504.7	2,121.6	1,881.4
Neurological, Spinal and ENT	1,252.4	998.0	760.4
Vascular	790.8	718.8	403.0
Cardiac Surgery	466.7	394.0	378.3
Cost of products sold	1,319.6	1,140.8	906.8
R&D expenses	**479.7**	**434.2**	**372.2**
Selling, general and administrative expense	1,587.9	1,320.4	1,052.4
Non-recurring charges	13.8	373.1	156.4
Purchased in-process R&D	-	152.0	-
Foundation commitment	-	-	36.0
Interest expenses	13.6	29.1	15.5
Interest income	(29.0)	(51.9)	(27.6)
Total cost and expenses	3,385.6	3,397.7	2,511.7
Earnings before income tax	1,629.0	834.7	911.4
Provision for income tax	530.5	358.4	316.8
Net earnings	**1,098.5**	**476.3**	**594.6**
Net earnings as % of net sales	21.9%	11.3%	17.4%
Earnings per share – basic	0.92	0.40	0.52
Earnings per share – diluted	0.90	0.39	0.51
Employees	24.890	22.518	18.503
Net cash provided by operating activities	**1,042.0**	**465.2**	**693.1**

Source: Medtronic Annual Report 2000.

Figure 18: Medtronic Europe/Middle East/Africa



Source: Medtronic (2000).