



## KNOWLEDGE TRANSFER OPPORTUNITIES FOR THE BIOSCIENCE SECTOR IN CHILE.

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### Abstract

In this article, the movement of knowledge and discoveries that take place in Chile, between academia and industry is reviewed. Examples of knowledge transfer activities, such as training, consultancy, contract and collaborative research as well as licensing relating to Chile's bioscience sector are presented. In addition, a knowledge transfer 'fitness' index of Chile's six leading universities is derived and analyzed. As a result, an approach for obtaining efficient knowledge transfer activities tailored to the biotechnology industry in Chile is proposed. Indeed, it is recommended that universities that lack intellectual property rights or knowledge transfer capacity concentrate their efforts in developing tailor made consultancy services, focused on biotechnology projects that could be turned into research collaborations with biotechnology companies. Finally, a number of useful information resources about the developments currently taking place in the biotechnology sector in Chile as well as a detail description of the mutual long term benefits of research collaborations to industry and academia are offered.

**Keywords:** Knowledge transfer, technology transfer, Chile, Biotechnology, Industry Academia Research Collaborations.

### 1. Introduction

Knowledge transfer is understood as the movement of knowledge and discoveries, mainly from academia, to the general public (CBI, 2001; Lambert, 2003; Reid, 2005). It can occur in many ways, for example, through publications, educated students entering the workforce, exchanges at conferences, or by establishing relationships between academia and industry.

According to Lambert (Lambert, 2003) the current industry-university relationship is being shaped by two global research and development (R&D) trends that are gradually changing the way academia and companies currently interact.

First, there is a tendency for companies to expand their research away from their own laboratories by actively seeking research collaborations with others. In other words, companies are moving from a close/in house innovation paradigm to an open/collaborative one. Secondly, not only research is being extramurally planned, but also the actual physical location of companies' R&D facilities is being moved where the most important markets are. This is especially true if those markets happen to contain centers of outstanding research (Lambert, 2003; Reid, 2005). Then, industry has a clear incentive to establish R&D collaborations with renowned academic institutions.

These trends are turning universities into attractive R&D partners for business. In fact, good academic laboratories operate in international networks, develop cutting-edge research and are constantly being refreshed by the arrival of clever new brains.

In Chile, however, the majority of university-industry interactions are still dominated by the old paradigm which is based on a customer-supplier relationship. A recent study focused on the technology transfer and intellectual property policies of a sample of 20 Chilean universities showed that 7 institutions were currently conducting technology transfer activities, 5 were filing their first patent applications and starting to implement their technology transfer policies, while the remaining 8 had recently started their internal debate on how they are going to approach the whole subject of technology transfer (IP Tour, 2005).

Nevertheless, in the bioscience sector, university-industry interactions are gradually being shaped into collaborations rather than simple service agreements. In addition, Business-University interactions are starting to be encouraged and studied by the Chilean government, mainly, through its research and economic development agencies. In fact, these interactions range from essential activities such as teaching and training people, to spinning out new

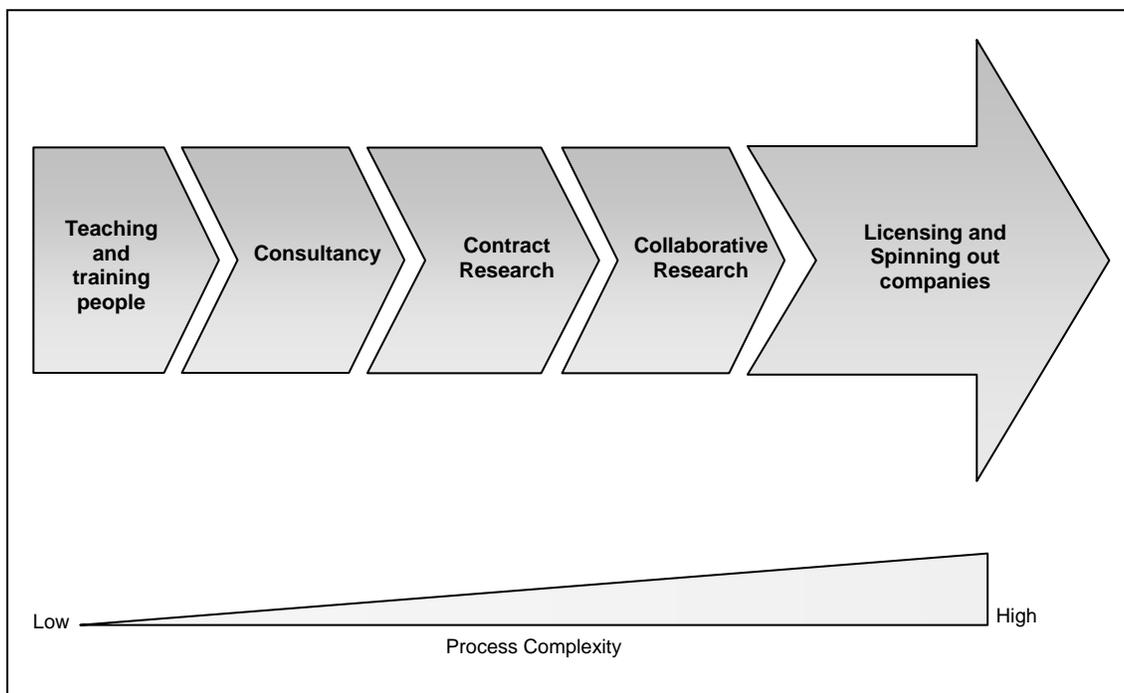
companies based on technologies and knowledge developed at universities.

In this article, the knowledge transfer practices that are being carried out in the Chilean Bioscience sector are reviewed. In addition, the knowledge transfer ‘fitness’ of leading Chilean universities is analyzed. Finally, an approach for more efficient knowledge transfer activities, tailored to the Chilean Bioscience Sector, is proposed.

## 2. Types of Knowledge Transfer that take place in Chile

As shown in **Figure 1**, most of the knowledge transfer activities that are being developed between Industry and University in Chile can be illustrated as a chain of events where the complexity of the knowledge transfer process increases the further down the chain.

**Figure 1. The Knowledge Transfer Chain between Industry and Academia in Chile.**



As shown above, knowledge transfer can be shaped in many ways; therefore, it is likely to become a complex and non-linear process. In other words, it is not simply a question of researchers coming up with clever ideas which are then turned into successful products.

Arguably, the most established and, possibly, successful form of knowledge transfer is the introduction of graduates from university to the marketplace. In fact, (Lambert, 2003)

argues that the best form of knowledge transfer comes when a talented researcher moves out of the university and into business, or vice versa.

### 2.1 Transferring knowledge through teaching

For a long time, teaching and training have been the core activities of higher education institutions, not only in Chile,

but also around the world. Only recently in Chile, the actual transfer of educated individuals from academia to industry has been studied as a key element of the university-business interaction (Santibáñez, 2004; Ramos-Belmar, 2005). This is clearly the most common type of knowledge transfer used in Chile. For example, internships, company visits, dissertations in industry, key note lectures from companies and industry-sponsored innovation and creativity competitions are some of the activities that are currently being undertaken to promote academia-business interaction in Chile.

On the other hand, more classical Executive Education-type of approaches have also been implemented to get industry and universities closer together. For example, full-time and part-time courses and education 'on the job' are the most common illustrations of how academia is serving the training and education needs of businesses in Chile.

## **2.2 Transferring knowledge through consultancy services**

The development of studies and the provision of expert advice based on technical skills, experience and knowledge of university's staff are proving to be a popular service that is being sought after by many companies in Chile, in particular, those from R&D intensive sectors. Indeed, a recent study showed that nearly half of Chile's most competitive firms have required consultancy services from one or more universities in their trading lifetime (Ramos-Belmar, 2005)

On the other hand, academia has learned to appreciate its consultancy business as an interesting and profitable source of revenue (Santibáñez, 2004). However, this whole consultancy opportunity is still at an early stage of development. For example, the Biotechnology Centre, at Universidad de Concepción, is well-known in Chile for offering technical consultancy services; however, only recently such services are being advertised via the Centre's website.

Regarding how consultancy income is distributed within Chilean universities, it is normally split between the academic staff that carried out the work and the university. The proportions and terms of this distribution of income can vary between universities (Santibáñez, 2004). For example, one third of the income generated from consultancy work at Universidad Austral de Chile, goes to the university, while the rest is distributed among the staff that conducted the study. On the other hand, at Universidad de Valparaiso, the distribution of consultancy income is not regulated at all, so in practice, university staff can carry out consultancy work on their own or on behalf of the university (Santibáñez, 2004).

Although university's advice is highly regarded by industry, Chilean universities, in general, are reluctant to allow much time to their academics for consultancy work (Santibáñez, 2004; Ramos-Belmar, 2005). There are very little incentives for academics to pursue consultancy work and, in some cases, peer-pressure among investigators can make academic advisors or consultants feel they are not being loyal to their academic vows.

## **2.3 Transferring knowledge through contract research**

Contract research refers to research work conducted by a university on behalf of a company where all the project specifications, like research objectives, length, methodology and deliverables, are governed by a service contract (CBI, 2001). Commonly, the entity paying for the service is looking for a research institution to help it solve a specific technical challenge that is usually related to a commercial application of its products or services.

With reference to contract research in Chile, it is normally commissioned by companies or by the Chilean government. Most of the contract research activities carried out by universities in Chile are to do with agricultural research, being the fruit and forestry sectors the most active areas that outsource their research needs to universities (Venezian, 1993; Jarvis, 1994). Indeed, in 1964 the Chilean Ministry of Agriculture created The Institute of Agricultural Research, INIA, a private, non-for-profit corporation dedicated to the development, adaptation and transfer of technologies from its laboratories to the agricultural sector in Chile. Nowadays, INIA is famous for its contract research capabilities in genetics and *in vitro* cultures of different crops and forestry specimens.

## **2.4 Transferring knowledge through research collaborations**

Usually, research collaborations are understood as co-sponsored research programs, where both, university and industry contribute resources and share the benefits of such collaboration, proportionally to their contributions (Lambert, 2003; Reid, 2005). Indeed, probably the most actively encouraged business-academia interactions these days in Chile are research collaborations.

For example, the Chilean Foundation for Agrarian Innovation, FIA, has implemented a research collaboration program based on consortiums. According to FIA, a consortium is understood to be "An association of business and technological entities, including university organizations, for the purpose of jointly developing a

program or project in the areas of research, development, and innovation based on the complementary efforts of the entities comprising the consortium” (FIA, 2005). In other words, a consortium is seen as a management vehicle to link the interests and skills of the Chilean scientific community with the public and private sector in order to help increase the competitiveness and business innovation of the Nation.

In general, university and business contributions can be in the shape of infrastructure (equipment, lab space, etc), highly qualified personnel and intangibles assets (information, contacts, ideas, processes, etc). What is more, companies are usually expected to contribute more financial resources than universities or are anticipated to act as collateral for funds contributed by the government or some funding agency (CBI, 2001; Lambert, 2003; Reid, 2005).

With reference to the benefits expected from such collaborations, it is widely agreed that patents, publications and knowledge are the most sought after outcomes. However, prototypes, feasibility studies and trained personnel (PhDs, MScs) are becoming increasingly popular, especially in Chile (Brunner, 2001; Ramos-Belmar, 2005).

### **2.5 Transferring Knowledge through Technology Licensing and Spin-Out Companies**

Technology licensing is commonly known in Chile as technology transfer. In essence, it refers to transferring the right to use a specific technology or invention in exchange of a payment. In other words, a university patents an invention and charges a fee to any third party who wishes to access or use such invention. However, in some cases the most effective way for a university to maximize its return on its intellectual property is through a spin-out company. This usually means the technology is licensed to a start-up company instead of a well established existing company.

In other words, the new born company –co-founded by the university and the research lab that invented the technology– gets a license (usually an exclusive license) to secure the right of use of the technology, which would act as its core component for value creation. In this way, the university owns part of the company, but at the same time,

the company has more freedom to further develop its exclusively assigned intellectual property.

In Chile, technology licensing and spinning out companies have become hot topics, in particular, after an important increase in the number of business incubators, currently 10, (Hernandez-Cuevas and Valenzuela, 2004; Corfo, 2006). These organizations support the entrepreneurial process, helping to increase survival rates of innovative start-up companies. Typically, they provide space for a number of businesses under one roof, and are located around Chile’s leading research centers (Corfo, 2006).

### **3. The knowledge transfer fitness of leading Chilean universities.**

Chilean universities are widely recognized as being among the best in Latin America. There are 63 universities in Chile, which can be divided into 25 state-subsidized (public) and 38 non-state-subsidized (private) institutions (World Bank, 2004; Mineduc, 2005).

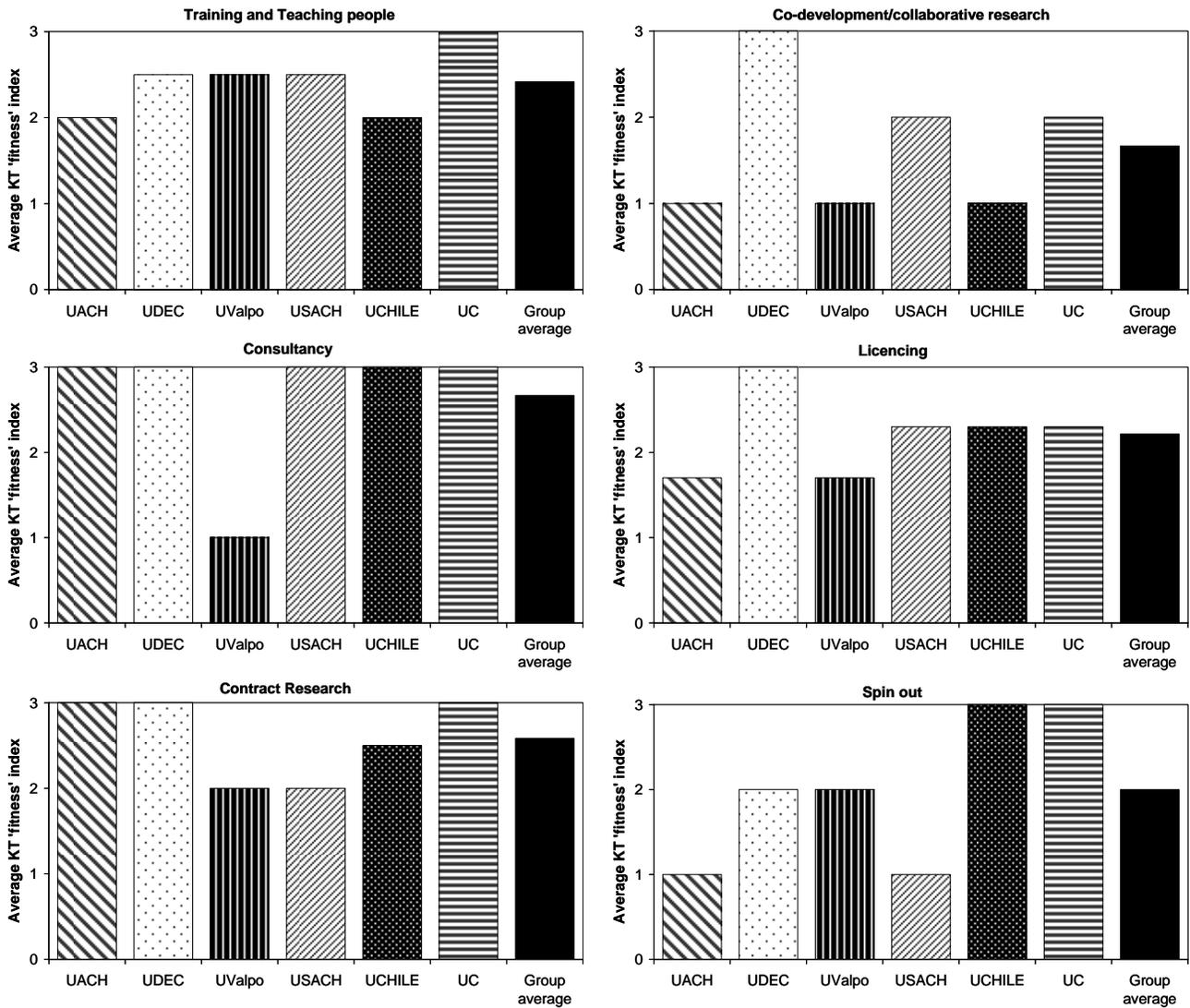
Chile currently uses competitive funding mechanisms to promote science, technology and innovation. However, most of the research and development is still being carried out by public universities (World Bank, 2004). In addition, the Chilean government invests 0.6% of its gross domestic product (GDP) in science and technology and it intends to double this investment from 0.6% to 1.2% of GDP by the year 2010 (Mineduc, 2005).

Based on the work carried out by Santibáñez in 2004 (Santibáñez, 2004), Chile’s top 6 public universities were evaluated in terms of their level of institutional performance and development of Knowledge Transfer policies. Santibáñez findings were converted into a scoring scale that has 3 levels of knowledge transfer performance: Level 1, or poor institutional performance; Level 2 or medium/regular institutional performance and Level 3 or acceptable institutional performance.

In **Figure 2** the average performance scores of the knowledge transfer policies of Chile’s top six universities are illustrated. In particular, their knowledge transfer performance is compared at every step in the knowledge transfer chain mentioned above.

**Figure 2.** Performance scores for the knowledge transfer ‘fitness’ index of Chile’s top six universities in every step of the knowledge transfer process (modified from

Santibáñez, 2004). KT: Knowledge Transfer. UDEC: Universidad de Concepción, UC: Universidad Católica, UCHILE: Universidad de Chile, USACH: Universidad de Santiago de Chile, UACH: Universidad Austral de Chile, Universidad de Valparaíso.



Overall, Chile’s leading universities, as a group, have better knowledge transfer policies in areas like training, consultancy and contract research than in collaborative research, licensing and spinning out companies.

However, in each type of knowledge transfer activity more than 50% of the universities have a performance score that is equal to or above the group average. Nevertheless,

collaborative research and spinning out companies seem to be areas where some universities are showing poor institutional performance.

On the whole, if all average performance scores are combined for each university, the total overall knowledge transfer ‘fitness’ index of Chile’s leading universities is obtained, as shown in **Figure 3**.

**Figure 3.** Overall knowledge transfer ‘fitness’ index of Chile’s leading universities (modified from Santibáñez, 2004).

	UDEC	UC	UCHILE	USACH	UACH	UVALPO
Overall knowledge transfer ‘fitness’ index	2.8	2.7	2.3	2.1	2.0	1.7

UDEC: Universidad de Concepcion, UC: Universidad Catolica, UCHILE: Universidad de Chile, USACH: Universidad de Santiago de Chile, UACH: Universidad Austral de Chile, UVALPO: Universidad de Valparaíso.

At present, all the reviewed universities have been described as having an arguably medium to regular institutional knowledge transfer performance. However, UDEC and UC are closer to an acceptable or optimal level of knowledge transfer performance leading the ‘fitness’ index by at least 0.4 points from the following academic institution.

**4. Biotech Knowledge transfer proposition**

On the whole, Chile has taken significant steps to incorporate biotechnology into its national economy, in particular by fostering the development of a world-class biotechnology sector that is aiming to leverage Chile’s global advantages in production and exportation of high

value added natural resources (Hernandez-Cuevas and Valenzuela, 2004; Orellana, 2004; Guerrero, 2005).

According to the Chilean Economic Development Agency, CORFO, the Chilean biotechnology industry is currently comprised of at least 123 biotechnology-related organizations focused either on improving the competitiveness of Chile’s main export sectors or creating innovative products for existing and emerging markets (Hernandez-Cuevas and Valenzuela, 2004; Corfo, 2006) .

**Figure 4** shows the number of Chilean biotechnology-related organizations categorized by type of organization.

**Figure 4.** Number and type of Biotechnology-related organizations in Chile, as of March 2006 (Corfo, 2006)

Type of Organization	Number of organizations
Manufacturing Companies	52
Service Companies	22
Research Centers	31
Technology Transfer Centers	8
Business Incubators	10
Total	123

As to the commercial focus of Chile’s biotechnology companies, 42% are interested in agriculture and livestock, 22% in human healthcare and nutrition, 8% in aquaculture, 6% in forestry and 22% in industrial biotechnology (Corfo, 2006).

In this context, the bioscience sector in Chile can be seen as an ideal area to exploit knowledge transfer opportunities that could boost the R&D capabilities of Chilean biotechnology companies, particularly, when the majority of ground breaking research is carried out at universities (Brunner, 2001; World Bank, 2004; Ramos-Belmar, 2005). Indeed, knowledge transfer activities between universities

and biotechnology companies can prove incredibly productive, especially if there are businesses looking for commercial applications of biological tools and processes.

What is more, for a university, the transfer of knowledge through licensing its inventions and technologies is part of its broader mission and, for a company, intellectual property is also appreciated as it gives a clear incentive to invest in R&D. Then, benefiting from intellectual property rights creates common ground for business and academia to interact.

However, the Chilean research community, as a whole, is just starting to become aware of the value knowledge transfer can give to the nation. This can be evidenced by the fact that 13% of all research intensive universities in Chile have enough intellectual property or technology transfer assets to set up a direct licensing relationship with industry (IP Tour, 2005). Therefore, the knowledge transfer approach has to be different from that which is currently applied in developed countries.

Consulting services may be seen as the first step to put university and industry closer together. One approach that may be established for the biotechnology industry in Chile would be to develop tailor made consultancy services, especially at universities that lack both intellectual property rights and knowledge transfer capacity. This would help them to attract the attention of national biotechnology companies that are looking to improve their technologies or

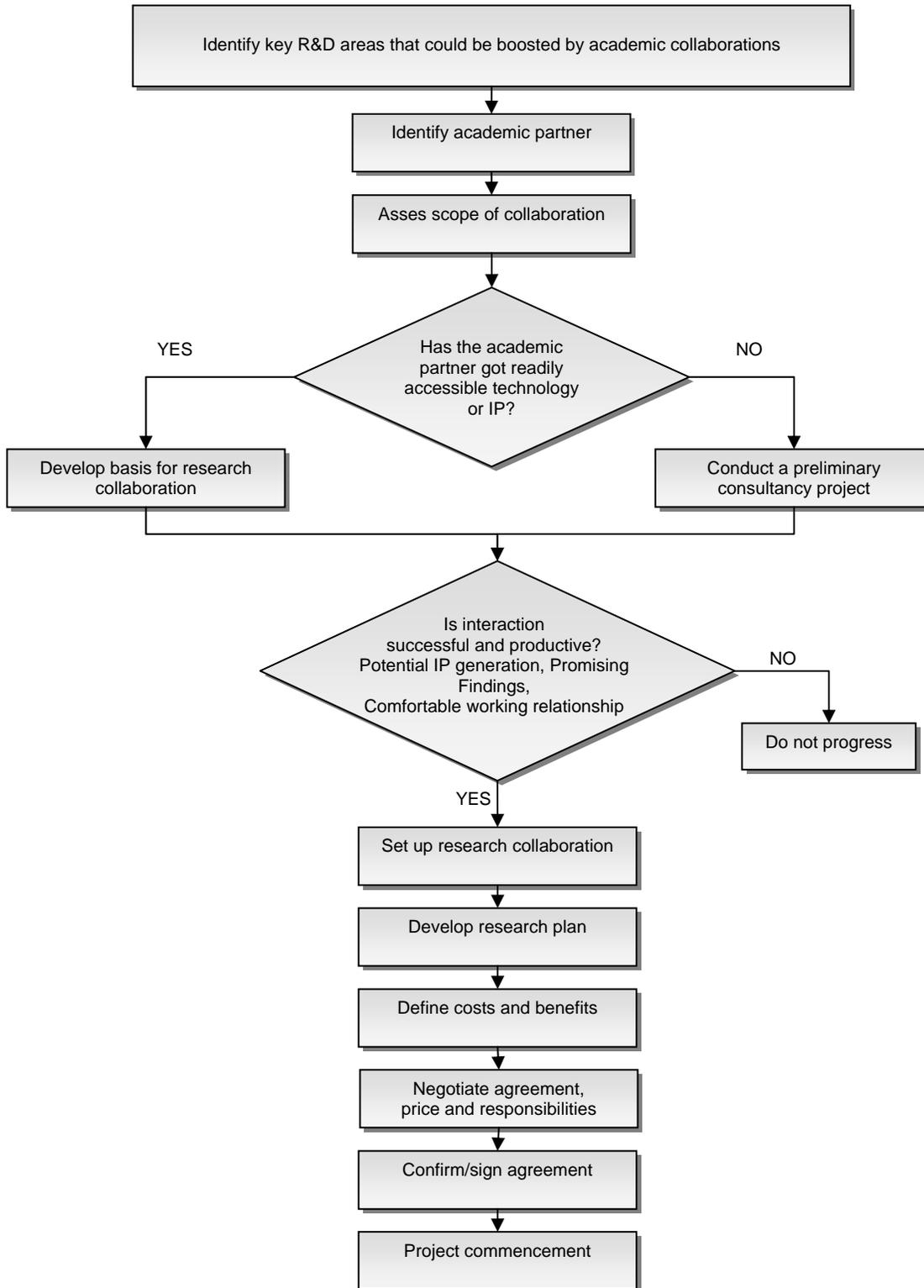
are looking for a research partner to develop new interesting technologies.

Indeed, a strategic consulting agreement may set precedent for a more fruitful and trusted interaction between a laboratory and a business. In other words, through consulting, both parties can get to know each other and plan more long term value-added collaborations. Then, after 'testing the waters' they may initiate a research collaboration focused on mutually interesting research problems where resources and benefits would be shared.

In this way, both, academia and industry may reap mutual benefits from developing new intellectual property and from maximizing their combined research capabilities. Indeed, if a biotechnology company wants to expand its research in a key area where its current expertise or depth of knowledge is limited, an initial approach of conducting a consultancy or research project with a potential academic partner may prove extremely useful.

**Figure 5** outlines the 'step by step' process of how to include a consultancy agreement prior to setting up a research collaboration with an academic laboratory. This framework may provide an interesting alternative for both, academia and industry, to set up a productive research collaboration, particularly when neither of them have enough knowledge transfer experience or intellectual property assets.

**Figure 5.** Outline of the ‘step by step’ process of how to include a consultancy agreement prior to setting up a research collaboration.



It is important for a company to identify an academic laboratory with unique expertise. Such uniqueness may be based upon many attributes such as knowledge, intellectual property, infrastructure, people, reputation, leadership in a technical field, valuable networks of contacts, access to funds and others.

Also, the biotechnology company would have to figure out what it may offer or contribute to this partnership (apart

from money) that would benefit the laboratory. Things that may be offered can range from accepting students to do their PhDs at the company to keenly participating in teaching activities. It is crucial that for these types of collaborations to work, a clear complementation of interests and skills should be in place. In other words, the alliance or partnership has to be strategic and long-term focused. Some of the benefits this long term collaborations can provide to both industry and academia are described in **Figure 6**.

**Figure 6.** Benefits of long term research collaborations to industry and academia.

TO INDUSTRY		TO UNIVERSITIES	
THINKING LONGER TERM	Accessing current research programs. Gaining an inside track on emerging fields and enabling technologies developed in universities	IMPROVEMENT MARKET AWARENESS	Gaining insight into the research problems of interest to particular companies or industrial sectors
BENEFITING FROM NEW IDEAS AND PAST EXPERIENCE	Getting an alternative perspective on problems. Access to accumulated research and scholarly knowledge through people, libraries, etc.	ENRICHING TEACHING PROGRAMS	Updating staff, sourcing ideas for students projects, developing curriculum material with practical examples, gaining new perspectives and new areas for teaching
GOING GLOBAL	Links with academics' extensive national and international networks	MAINTAINING RESEARCH MOMENTUM	Gaining status, prestige, keeping projects live and developing new ones
OUTSOURCING	Harnessing the efficiency and/or cost effectiveness of getting research done by a university. Can be used to smooth fluctuating in-house demand	APPLYING KNOWLEDGE	A chance to apply skills and knowledge to solving real business problems. Widening the customer base for your network
COMPLEMENTING THE COMPANY'S SKILL BASE	Access to skills within universities that company staff lack	COMPLEMENTING THE UNIVERSITY'S SKILL BASE	Learning new skills and techniques developed in industry
TAKING A MULTIDISCIPLINARY APPROACH	Accessing a range of disciplines at once in a university (e.g. Providing the background for technology integration projects)	LEARNING BUSINESS PROCESSES	Learning new approaches to managing projects and how industry works e.g. through sponsored positions, seconded staff, guest lectures, etc.
HARNESSING PUBLIC FUNDS	Bringing additional financial resources to bear on research and thereby spreading costs	HARNESSING PRIVATE AND PUBLIC FUNDING	Drawing on a wider range of private funding. Access to public funds that require industry collaboration
REDUCING RISK	Sharing costs, releasing staff time, finding out what others are doing, keeping options open...	BUILDING ON EXCELLENCE AND REPUTATION	Establishing a track record with industry, breaking new ground and enhancing prospects
COMPLEMENTING THE COMPANY'S PHYSICAL RESOURCE BASE	Accessing unique or specialist university-based equipment, facilities and services	COMPLEMENTING THE UNIVERSITY'S PHYSICAL RESOURCE BASE	Accessing state of the art facilities and services that the university may lack

Extracted from (CBI, 2001)

Finally, if a collaboration program is well-defined and tested, ideally through previous consulting interactions, it is likely that both parties would work well with each other. In fact, if a good level of coordination is reached, both the laboratory and the company may easily boost their credibility, visibility and reputation. In most cases, a successful collaboration may increase the reputation perceived by their peers both in industry and in academia.

## 5. Conclusion

Arguably, there is some interesting knowledge transfer activity going on in Chile. In effect, knowledge is currently being transferred from academia to industry at several dimensions, from teaching and training to spinning out companies.

However, knowledge transfer in Chile may be considered at an early stage of development, as not only the overall knowledge transfer fitness of Chile's leading universities was ranked as medium or regular, but also a recent study found that just 13% of all research intensive universities have enough intellectual property, or technology transfer assets, to set up a direct licensing relationship with industry (IP Tour, 2005).

At present, technology transfer activities are being carried out by a small number of universities and therefore the level of overall university-business interactions in Chile may be perceived as limited or virtually nonexistent. However, the IP Tour study highlights that nearly 10% of all Chilean universities are starting to implement technology transfer policies and are initiating concrete actions with regards to securing their intellectual property by filing patent applications (IP Tour, 2005). Then, it may be argued that the proportion of universities that may be considered as 'technology transfer aware' is approximately 23% of all Chilean universities (10% starting technology transfer activities + 13% currently conducting technology transfer activities). Nevertheless, the remaining 77% of universities are not involved in any technology transfer activity yet. Further investigations on why is this happening are needed.

In this context, an option to help accelerate the development of business academia interactions may be to foster consulting services tailored to the biotechnology industry in Chile. After all, providing consultancy services should be less complex and much straight forward than setting up contract research agreements or spinning out companies.

A good starting point may be to target consultancy work that can lead to collaborative research. Then, intellectual

property and cutting-edge knowledge may be generated. Undoubtedly, these outcomes will benefit both, academia and industry. However, providing high-standard consultancy services especially designed for the Chilean biotech sector should be developed as a comprehensive and professional service. Indeed, more incentives may be needed to encourage both academia and researchers to deliver such value-added advice.

For example, a university that offers high-standard consultancy services, tailor made for the biotech industry, could generate more income, recover overheads, increase its chance for future collaborative projects, recruit new staff, improve its reputation and even diversify its profile as an open research institution that welcomes interactions with industry.

Likewise, researchers themselves can gain from working as advisors for industry. For example, through their consulting work they can generate income for their labs, increase the chance to turn the consultancy work into a collaborative project, progress their careers, employ new people in their lab and, overall, access more funds to accelerate their research.

However, one point that needs to be taken into account in any high-standard consulting service is to avoid any conflict of interest. This may happen when a university employee, through a relationship with an external organization is in the position of influencing university affairs to generate a direct or indirect financial reward. Sometimes it may also happen when the researcher's activities with a company have a negative impact on his research or teaching responsibilities; or when he gives an inappropriate advantage to a client company in detriment of the university.

On the other hand, it is essential to carefully think how commercially-sensitive data will be handled by the university. If this is not properly addressed, or if the project is poorly managed, prospects of future collaborations and knowledge transfer activities with industry may be undermined. However, in the case a consulting agreement is successfully turned into a research collaboration, future intellectual property rights need to be negotiated. Ideally, collaboration contracts should be developed as soon as possible to cover the ownership and exploitation of future intellectual property.

Another aspect to keep in mind is that research in Chile enjoys a technology transfer norm that is very similar to the famous USA's Bay Dohle act; which declares that intellectual property derived from university research, funded by the government, belongs to the research institution and not to the government. In particular, under

the research norms that control the Chilean Fund for the Promotion of Scientific and Technological Development (FONDEF), the same principles of the American Bay-Dohle act are applicable to research carried out in Chile (IP Tour, 2005). Indeed, this norm may act as a further incentive for Chilean universities to transfer their knowledge and promote intellectual property protection. After all, the economic benefits from commercializing such intellectual property can be solely enjoyed by the education institution and its collaborators.

To sum up, Chile's knowledge transfer activities are expanding but it seems there is much more to be done. Offering high-standard consultancy services, focused on biotechnology projects with the potential to turn them into research collaborations, would be a promising starting point. This would be greatly enhanced not only if any conflicts of interest are cleared previous to the consultancy stage, but also if the academic conducts the project according to professional project management and commercial confidentiality practices.

## 6. Additional Resources

**Figure 7** brings together a number of useful information resources that would help readers get a better picture of the type of research, institutional support and commercial

Ideally, if a research collaboration takes place –as a consequence of a consulting agreement– the potential for both, business and university, to develop new knowledge and intellectual property would be significant. Then, based on this model, universities may gain intellectual property assets at the same time they establish a stronger bond with industry. In any case, universities may have to get better at identifying their areas of competitive strength in research. Government may have to do more to support business-university interactions; and business may have to learn how to exploit the innovative ideas that are being developed in the university sector.

Overall, it seems that through the implementation of a simple and straight forward cross-sector consulting campaign, the Chilean biotechnology industry may be able to access and develop valuable relationships with research laboratories that may become profitable research collaborations, where intellectual property and cutting edge knowledge may be developed.

developments that are currently taking place in the biotechnology sector in Chile.

**Figure 7.** Useful resources about the biotechnology sector in Chile

<b>Leading Research Centers</b>	
Center for Biochemical Engineering and Biotechnology (CIByB) Universidad de Chile	<a href="http://www.cibyb.uchile.cl">www.cibyb.uchile.cl</a>
Vegetal Biotechnology Center, Universidad Andrés Bello (CBUNAB)	<a href="http://www.unab.cl/sitio-html/investigacion/cbv/cbv.htm">www.unab.cl/sitio-html/investigacion/cbv/cbv.htm</a>
Biotechnology Center Universidad de Chile	<a href="http://www.ciencias.uchile.cl">www.ciencias.uchile.cl</a>
Biotechnology Center "Dr. Daniel Alkalay Lowitt" (CBDAL) Universidad Técnica Federico Santa María	<a href="http://www.biotec.utfsm.cl">www.biotec.utfsm.cl</a>
Biotechnology Center, Universidad de Concepción	<a href="http://www.centrobiotecnologia.cl">www.centrobiotecnologia.cl</a>
Center for Reproductive Biotechnology Universidad de la Frontera	<a href="http://www.med.ufro.cl/carpetas/cebior/centro.htm">http://www.med.ufro.cl/carpetas/cebior/centro.htm</a>
Center for Research in Silvoagricultural Biotechnology (CISB Independent research centre)	<a href="http://www.cibs.cl">www.cibs.cl</a>
Biotechnology Center Universidad Iberoamericana de Ciencias y Tecnología UNICIT	<a href="http://www.unicit.cl">www.unicit.cl</a>
Biotechnology Center Universidad Arturo Prat	<a href="http://www.unap.cl">www.unap.cl</a>
Institute of Vegetal Biology and Biotechnology (IBV) Universidad de Talca	<a href="http://biologia.otalca.cl/index.htm">http://biologia.otalca.cl/index.htm</a>
Science for life foundation	<a href="http://www.cienciavida.cl/">http://www.cienciavida.cl/</a>
<b>Useful Industrial and governmental institutions</b>	
The Chilean Economic Development Agency	<a href="http://www.corfo.cl">www.corfo.cl</a>

ASEMBIO Biotechnology Industry Association of Chile	www.asembio.cl
SOFOFA, Federation of Chilean Industries	www.sofofa.cl
CONICYT, National Commission for Technologic and Scientific Research	www.conicyt.cl
CBC Chilean Association of Biotechnology Professionals	www.colegiodebiotecnologos.cl

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#### Business Incubators

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Access Nova	www.accessnova.cl
Austral Incuba	www.australincuba.cl
Genera UC	www.generauc.com
IDEA-Incuba	www.ideaincuba.cl
Incubatec	www.incubatec.cl
INER LOS LAGOS	www.inerloslagos.cl
Octantis	www.octantis.cl
SABIO	www.sabio.cl
Santiago Innova	www.innova.cl

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