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ESTABLISHMENT OF CENTERS FOR INNOVATION TECHNOLOGY TRANSFER AND ENTREPRENEURSHIP (CITE) IN CHILE

PREPARED FOR

CONSEJO NACIONAL DE INNOVACION PARA LA COMPETITIVIDAD

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EXECUTIVE SUMMARY

Chile has unique natural resources, a democratic and competent government, clearly established key industry sectors, a strong university system, and a core of quality research. In addition, its government is committed to technological innovation as an engine for economic development. Any strategy for technology transfer and wealth creation should take the above factors into consideration. The Productive Sectors, such as fruits, aquaculture, forestry, food industry, mining, engineering, information technology, and related areas of biotechnology have unique issues and require a specialized organization of personnel and teams to properly develop and commercialize such opportunities.

The objective of this report is to propose a support program for technology transfer and marketing in the main Chilean research universities and research centers. In developing the ILB model it was necessary to evaluate the current management capabilities of universities with respect to R& D funding and generation of intellectual property, spinoffs and licensing agreements. The proposed model is defined in terms of (i) organizational structure, (ii) operating scale, (iii) profile of specialized personnel, and (iv) links with investors and the productive sectors. The report also defines specific practices designed to enhance the innovation culture among university and other research groups and to link business development with national and international networks.

During the period from 1996 through 2007 certain Chilean Government funding agencies (CONICYT, FODEF, CORFO, FIA) invested US $951,212 million in R&D in Chilean Universities. An additional US $941,122 million were invested in other Chilean research organizations. This represents an average investment through the period of $157,686 million dollars per year. During the last few years R&D investment has steadily increased and it estimated that presently Chilean universities and research institutes spend approximately $216 million in R&D per year. As a result, this funding is now generating a steady flow of research results that requires an effective management of the IP being created. Ideally, a high percentage of this IP could be transferred to the productive sectors or used to create new business opportunities.

It has been generally recognized and corroborated by the observations of ILB, that within the Chilean university system there is a culture that promotes academic research coupled with significant government funding. A fine track record of publications has been established by many of the scientists, showing 8,072 ISI publications from 2006 through April 2009. This represents 2,421 ISI publications per year. Technology transfer in Chilean Universities, however, has not kept pace with the steady output of scientific results being generated. Between 1996 and 2009, Chilean universities applied for 371 patents mostly in Chile (26 international) of which 38 have issued. Approximately one half of the patents were filed between 2005 and 2009. Based on these figures and compared with prior adjustment to developed countries like the US where 35 patents are filed for every $100 million spent in R&D, Chile is operating under 30% capacity in this field (11 patents filed for every $100 million). When considering only international patents, the figure is 0.7 patent files for every $100 million (less than 3% capacity).

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Licensing activities and the creation of spinoffs as a result of university inventions during the last 10 years has been limited in Chile. ILB could not obtain reliable figures, but based on information obtained from some universities and technology transfer organizations only a few patents were licensed during the period and only a handful of new companies were created. Considering that during the last 12 years Chilean universities and other research institutes received in excess of US $2 billion in R&D from the government, the output in IP and business creation seems inadequate and discouraging as a mechanism for strong economic development.

The primary obligation of Universities in conducting research and scholarly activities is the pursuit of knowledge for the benefit and use of society. Although university research is not directed intentionally toward inventions, valuable inventions do often result as result of research conducted by faculty, staff, students, and others. The transfer of the university inventions to the marketplace, the publication and availability for educational purposes of the fruits of such inventions, and the achievement of a fair and equitable distribution of net license revenue, which acknowledges both the contribution of the inventor and the university, can best be assured by providing the university with ownership of the university inventions and related intellectual property. An effective flow of technology for public benefit can only be accomplished when policies covering the management of IP and potential conflicts of interest (COI) are transparent and uniformly applied.

Technology transfer is a complex process and careful thought must be given to strategic and tactical issues to ensure that this becomes an activity of excellence with high probability of success. It is generally accepted that there is a real risk of distraction and disorientation of the program if the objectives and stakeholders of the process are not clearly identified and maintained as the primary focus of the process. Stakeholders of the technology transfer process include researchers, faculty, university administrators, investors (such as angel and venture capitalists), entrepreneurs and Chilean corporations. While all will benefit from a smoothly functioning technology transfer process, these individuals and organizations will have different goals, timelines and requirements.

ILB has identified two major objectives for a national technology transfer program. A new, more functional technology transfer program and organization will catalyze the continued growth and development of Chile enabling it to become a globally competitive country through maximizing the value of Chile's natural and intellectual resources and infrastructure.

These two major objectives for a national Chilean technology transfer program are:

1. To maximize the societal benefit of research results generated by Chilean universities and other non-profit research organizations, i.e. return on investment in research funded by taxpayers; and

2. To act as an engine for economic development by developing and fine tuning innovative businesses with local and global applications, job creation and revenue generation

ILB believes that focusing on these goals is extremely important so that the available, limited resources of the Chilean education and research system will not be overstretched by other demands on technology transfer efforts, such as acting only as a resource or revenue flow for the

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university or research institute scientists. Either of these distractions, while being fine goals in themselves, will compete with the main objectives of the initiative.

Based upon these considerations, ILB proposes the creation of a network of **Centers for Innovation, Technology Transfer and Entrepreneurship (CITE)** to link the activities of several universities or research institutes and coordinate them with the investment community and productive centers. The number of CITE's to be established will depend on the size of the R&D programs of Universities and research institutes and their geographic location. Based upon a hierarchical clustering approach, ILB recommends the creation of three to four CITES clustered around certain geographic areas.

Each CITE activities include:

1. Maintain awareness and provide information regarding IP among university stakeholders:
   - Workshops, presentations, publications
   - Maintain records of sufficient detail for further evaluation of the process
2. Identify novel ideas and technologies that could be translated into commercial opportunities
3. Protect and Manage Intellectual Property:
   - Intellectual Property Services: Patent prosecution and management
   - Licensing
4. Linkage and outreach to industry and productive sectors:
   - Networking
   - Technology Fairs
   - Direct communication with productive and investment sectors
5. Assistance to spinoff of new businesses:
   - Network with serial entrepreneurs
   - Establish strong venture capitalists and angels network
   - Identify and promote funding sources (state, region etc)
   - Linkage to technology parks and incubators

Four major stakeholders in university technology transfer include (i) universities and research institutes, (ii) government funding agencies, (iii) productive sectors, and (iv) the investment community. With an effective flow of technology from the universities, all stakeholders will benefit financially. Stimulus funding in the form of grants from government funding agencies provide the universities with means to develop novel IP, which in turn, benefits productive sectors and the investment community through the creation of spinoffs and licensing of technology. The resulting new businesses provide increased employment of Chilean scientists and engineers trained by the universities. Newly employed professionals and startup businesses promote economic development and increase tax revenue to the government. While this flow of resources and revenue seems self-evident, the key to the successful flow of grants, ideas, IP, licensing and products lies in the ability to ***identify IP*** and ***structure licensing deals and the creation of spinoffs*** that are fair to all parties.

Three key specialized positions, the CITE Executive Director, Innovation Agent (IA) and Patent Agent (PA) are essential to the success of CITE functions. The duties of the Executive Director are to establish TTO in Chile and work closely with universities, government funding agencies,

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key industries, incubators, venture capital and entrepreneurs to promote access to and licensing of intellectual property from the universities. The IA is a critical position within the CITE. This individual must have both a strong scientific as well as business background, preferably post graduate degrees, and be capable of recognizing opportunities at the scientific level for market applications. A third important position in the CITE model is the Patent Agent (PA). This person would have the responsibility (i) to *rapidly* translate an invention disclosure into a US provisional application, (ii) to work directly with the faculty-inventor to review the prior art, (iii) to suggest changes in experiments to enhance the novelty of the proposed invention, and (iv) to craft the patent application and draft claims before it is sent out to the contracted IP law firm.

An estimate of CITE staffing and productivity based upon Chilean funding of R&D at $100 and $300 mm USD per year were based upon the Association of University Technology Managers (AUTM) figure of $45 billion US R&D funding for the year 2006. This level of funding employed 1,800 people in technology transfer. Breakdown of job responsibilities of the 1,800 persons was not available, so the information from CCTEC organizational chart was used to estimate the relative numbers of individuals serving in Technology Commercialization and Corporate Liaisons (51%), Intellectual Property Services (9%) and Operations and Finance (26%). These relative figures suggest CITE employ six persons in operations and finance, seven IA, and three PA for every $300 mm USD of R&D funding. Based on ILB observations, at the moment Chile lacks a critical number of adequately skilled personnel that fits the IA profile. High priority must be given to a concerted effort to recruit (overseas if necessary) and train professional personnel in the field of technology transfer and entrepreneurial development.

At the level of staffing proposed and annual R&D support in Chile of $300 mm USD, it is anticipated that a fully functional CITE organization would process 126 invention disclosures and 106 US patent applications. Further, 33 licenses would be executed and another 84 managed. One would also expect five new products and four start-up companies to be generated. Finally, the ROI, as estimated from AUTM-Forbes 2006 is projected at 8.7%.

Given that the projections for deal flow are derived from the relatively mature technology transfer efforts of US academic institutions, it will of course take some time for Chilean technology transfer to reach these estimates. Exactly how long the CITE program will take to attain the more mature deal flow of US universities is uncertain and dependent upon several variables. First, the experience and dedication of the CITE Executive Directors, IA and PA are critical to the launch and growth of the model. Next, in no particular order are:

- The level of national R&D funding,
- University support and encouragement of the faculty-inventor and
- Construction of pilot plant facilities.

Allowing between six months to one year for the identification and hiring of the first Executive Directors, IA and PA, the maturation process would be expected to continue for at least five to seven years to reach full maturity.

The fundamental relationships of the **CITE** include one or several universities or R&D Institutes (grouped by geographic regions and/or productive sectors) properly linked to productive sectors, investment sources and facilities to start new business. The productive sector includes (i) Fruits, (ii) Forestry, (iii) Nutrition (processed foods, nutraceuticals and swine & poultry), (iv)

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Aquaculture, (v) Mining, (vi) Engineering, (vii) Information Technology, (viii) Biomedicine & Diagnostics, and (ix) Consortia (e.g. FDF and Intesal). Next, the investment sector is a key component where the government must play an active role by funding or providing logistic support to CITE activities through Development Agencies such as (i) CORFO, (ii) Department of Education (MECESUP), (iii) CONICYT-FONDEF, (iv) Direct Government Support (AFD), and (v) INAPI (efficient access to IP information) as well as Angel Networks, Venture Capitalists, and Tech Parks & incubators (funded by government and/or regions).

An effective way to catalyze new businesses based on technology from universities affiliated with CITE could be the creation of a venture capital funding and business development vehicle. This vehicle should be a "Venture Firm" wholly owned by the universities and directly linked to CITES, research parks and business incubators. The advantages of a Venture Firm can be summarized as follows:

- Combine public seed money and larger private venture funding elements through syndicates; i.e. The CITE Venture Firm may lead deals involving a number of investors
- Incentive to identify new technologies and business through CITE to quickly create a robust portfolio of start up companies
- Access to very early technology with an opportunity to be involved with the business plan and early stage management
- Provide easy access opportunities for universities to have students participate in intern programs

There are two significant linkages for the interaction of funding agencies, and productive and investment sectors with CITE – a CITE Shared Operational Support Office, and the CITE Board of Directors. Within the CITE Shared Operational Support Office, the Executive Director works closely with the IA and staff to foster communication with the Productive Sectors and Markets through networking, technology fairs and direct communication. Through the Committee on University-Productive Sector and Graduate Education Programs, the CITE Board of Directors can serve to:

- Identify general and specific requirements for the education process
- Adopt approved curricula, lobbying the government for funds to support faculty and as importantly the students,
- Monitor the progress of new initiatives against the stated goals for the programs and
- Introduce new procedures as the programs mature and their effects can be seen.

As previously described, each CITE will have an Executive Director and four to six IA plus support staff depending on the size of the operation. A CITE Shared Operational Support Office, however, would oversee shared activities common to all CITE such as database and financial management, patent and licensing management, and outreach programs. Essentially the CITE Shared Operational Support Office would become a "one-stop" shop for the productive and investment sectors interested in the latest IP developments at Chilean universities. Additionally, government funding agencies would interact with the Shared Operational Support Office CITE to access productivity and return on investment metrics at more frequent intervals than yearly grant progress reports. This Shared Operational Support Office CITE will also be responsible for the harmonization of IP and COI policies among the universities.

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CITEs are essential to promote innovation, create new business and increase the industrial capabilities and output in key strategic sectors of the country. A successful network of CITE's will translate in greater industrial output, more jobs and tax revenues for the government. CITE's should be fully funded by the government for at least five years with some cost sharing support for IA's from the universities and research institutes. As CITE becomes successful reliance on government funding and cost sharing from universities and research institutes will decrease, but in all probability never reach zero.

The CITE Board of Directors will be representative of the universities, relevant productive sectors, investment and funding agencies and contain at least one independent member. The overall number of directors should be at least representative of all of the sectors. An Executive Committee consisting of representatives of universities, relevant productive sectors, investment and funding agencies and one independent member will oversee the operations of the CITE. The CITE Oversight Committee is a committee at the national level that will be composed of representatives of the funding agencies, CNIC and international experts to provide recommendations and guidance regarding:

- Overall strategic direction, and
- Harmonized
    - Funding
    - Faculty evaluation, and
    - Patenting policies and metrics at the national level

Possible agencies to be involved through direct funding or implementation of policies in support of innovation:

- CORFO- INNOVA
- Department of Education (MECESUP)
- CONICYT-FONDEF
- Direct government support (AFD)
- Chilean Patent Office (INAPI)

It is recommended that net revenues generated from licensing, equity investment and other income be shared by the stakeholders. ILB recommends the following sharing percentages:

- University/research institute: 80%. The inventor(s), department and college would split this figure as follows:
    - Inventor: 50%
    - Department: 20%
    - College: 10%
- CITE: 20%

During the first years of the program, consideration should be given to maintain the inventor's share at 50% or higher to encourage increasing participation of faculty.

With the implementation of the CITE model for technology transfer, the inclination is to utilize existing technology transfer capabilities in Chile for perceived efficiency and economy. Leading universities in Chile have recently started to make some attempts to build technology transfer offices (TTOs) to manage their IP assets and other interface activities with the productive sector,

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but their skills, experience and outcomes vary widely and are not yet performing at international levels. In order to maximize the efficiency of introducing the new approach and to employ existing infrastructure and staff where possible ILB devoted considerable deliberation to the utilization of existing Chilean technology transfer capabilities in the CITE model. Based upon ILB team own experiences in the US and two fact-finding visits to Chile, it is recommended that the CITE model be implemented using a "best efforts" approach to patenting and licensing of university technology and the creation of new business. Best efforts imply exhausting all possible avenues to develop the disclosed technology into a patentable form or link it to a market application as a spinoff or license. In this scenario, it is necessary to work closely with both the faculty-inventor and production and investor sectors.

Personnel involved in university technology transfer are key to the success of any technology transfer program. ILB recommends an emphasis on recruiting personnel with specific experience and skills for the CITE model that may rely more on recruiting outside of these organizations and Chile for the initiation of the program.

Based on ILB observations, at the moment Chile lacks sufficient and adequately skilled personnel to successfully manage and operate technology transfer and commercialization offices. ILB has identified three key positions necessary for the optimal functioning of CITE technology transfer. These positions are **Executive Director**, **Innovation Agent** and **Patent Agent**. In addition, it will be essential to have a critical mass of personnel that could join the program as quickly as possible. High priority must be given to a concerted effort to recruit (abroad if necessary) and train professional personnel in the field of technology transfer and entrepreneurial development. CITE will require senior Executive Directors (initially two) with a good grasp of science and technology, proven experience in intellectual property management and new business development. The Executive Director will lead a CITE in Chile that will support several local universities. The individual must be self-motivated with a proven track record in leading technology transfer activities in universities.

CITE will also require a number of Innovation Agents (initially four to six) in several disciplines with the following skills:

- Strong scientific and business background (post graduate degree) capable of recognizing opportunities at the scientific level for market applications
- Ability to interact effectively with faculty members, technology developers, productive sectors and the investment community
- Ability to structure reasonable business deals (spinoffs, licenses etc.) for beneficial partnership
- Energetic and self-driven

Patent Agents are required to have a technical degree (such as engineering, biology, chemistry or physics) and must take the *Examination for Registration to Practice in Patent Cases Before the United States Patent and Trademark Office*. While passage of this examination is a requirement for registration to practice in the US, in the CITE model this represents a level of achievement and attainment of knowledge by the PA more than entry to practice. The PA reports to the Executive Director and works with the IA. The duties of the PA include identifying and guiding

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the protection of IP through the patenting process from the invention disclosure stage, filing, prosecution and allowance stage. This will involve:

- Review all disclosures with IA
- Perform a preliminary patentability search for all disclosures
- Maintain a close relationship with faculty inventor during the disclosure process
- Inform the faculty inventor of the results of the patentability search on all disclosures
- File provisional patent applications when considered necessary
- Maintain a close relationship with contracted patent firms
- Raise the awareness of university faculty and others involved with research of identifying patentability of research results
- Promote the CITE on an ongoing basis with regular workshops and seminars at a local and National level

In addition CITE will need to be staffed with accounting, paralegal and administrative personnel that will be part of a Shared Operational Support Office (e.g. financial management, database services, IP services, outreach activities etc.). ILB recommends recruiting at least one senior manager from established technology transfer programs in Chile (universities, private consulting business, and incubators). The second manager probably will need to be recruited outside of Chile.

It is essential for the success of the program that CITE is staffed with highly skilled Innovation Agents and other key personnel as quickly as possible. Efforts should be made to bring on board skilled personnel presently involved in Chile or abroad in technology transfer activities. Parallel to the immediate recruiting, an efficient way to bring qualified people on board will be to train a number of IA (initially four to six) in technology transfer centers at top USA universities. The training will involve hands on experience by working in several aspects of the technology transfer process for a period of six months. ILB recommends the following Universities: Cornell University, University of California (UC Davis, San Diego, Berkeley, UCLA), Duke University, Boston University ITEC, and University of Illinois.

The University-Productive Sector relationship needs to be evaluated and enhanced, and results from changes in emphasis of this relationship measured from both perspectives. There has been an apparently increasing divergence between academic and commercial interests within the global university systems and there is now real concern that in certain fields traditional academic education may not address the short and long-term needs of the productive sectors. It is necessary that university education programs should properly respond to the present and future labor market in Chile. More use should be made of involving the productive sectors in the formal postgraduate education system. In addition a general university innovation and entrepreneur-oriented curriculum should be developed as part of the overall effort to increase the quantity of well educated leaders for Chilean industry.

Technology transfer is a term used to describe a formal transfer of rights to use and commercialize new discoveries and innovations resulting from scientific research to another party. The keystone of technology transfer is the protection of IP through the filing and attainment of a patent or copyright. Use of the IP is measured in terms of spinoffs, licensing and creation of products.

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The major steps in the patenting process include:

- Disclosing of the innovation
- Searching the prior art
- Filing a provisional application
- Filing a nonprovisional application
- Prosecuting the patent application and
- Entering the PCT (Patent Cooperation Treaty) process

CITE may negotiate a license to a university invention and related property rights to promote the likelihood that the university invention will provide a benefit to the public and the university. The license will generally cover nonrefundable license fees, patent expense reimbursement, royalty and minimum royalty payments. If the licensee does not take effective steps within a reasonable time to achieve practical application of the university invention, the university maintains the right to grant a license to another licensee upon terms reasonable under the circumstances.

In many universities, the Technology Transfer Office is mainly occupied with licensing. Spin offs are treated with suspicion, as too complicated compared to a nice quick license. In addition, spinoffs can produce conflicts of interest, where the academic is also a company shareholder and board member. Moreover, it seems safer for the university to keep its hands off, and just sign a simple license and collect the royalties.

The main problem with this attitude is that most university research doesn't usually result in a nice neat invention, ready for a nice neat license. University research usually produces something that works sometimes in the laboratory but significant development is necessary before it could be released onto the market. Unfortunately, most companies don't want to undertake this development work. It seems too risky, and too expensive. And, of course, the fact that they will have to do all the development work means that they are unwilling to pay much to the university.

So, in many cases a spin-off company is a necessary step to develop the product, and demonstrate its market, to take some of the early-stage risk out. In the particular case of Chile, ILB sees the spinoff option as critical for economic development particularly in the clusters defined by the country innovation policy. This will allow the creation of value added in these areas, new jobs and to be able to better compete in the global economy. The new spinoff company can raise the initial funds through CITE's Venture Capital Vehicle previously described in conjunction with small business grants and other venture funding Once the product is fully developed, and customers are clearly keen on getting it, larger companies will suddenly become very interested, and will start to offer much larger sums of money for exclusive rights. And, of course, the company still has the option of turning down these offers, and selling the goods or services themselves, building up the value of the company so it may eventually be worth millions to the shareholders.

In summary, when dealing with spinoffs the university should:

- Control the intellectual property

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- Concentrate its efforts through CITE on company formation, not company management
- Provide management support to the academics in the first year or so, but then phase out university involvement
- Encourage new companies to stand on their own feet, financially
- Look for outside investment funds early
- Expect little financial benefit in the first few years, but after five years, the benefits can be very large.

The introduction of new products from a university requires the interaction of several factors. The pattern of university product development follows several general rules:

- A dedicated faculty member or research team
- Public funding of new product ventures
- Strong relationship or interaction with a committed stakeholder group
- A technology transfer group supporting product development, and
- Pilot plant facilities for formulating potential commercial products

Early numerical measures of academic technology transfer include:

- Number of invention disclosures
- Number of patents filed
- Number of license agreements executed
- Number of spinoff companies formed

Later numerical measures that can be applied include:

- Revenues from license fees
- Royalties and cash from equity investments paid to the institution
- Numbers of products successfully introduced into the market

Non-numerical benefits to the university:

- Ability to retain entrepreneurial faculty
- Attract outstanding graduate students
- Increase reputation for innovation
- Augment its research program through the interaction with the private sector

Enhance its reputation for providing highly trained students for the industrial work force.

CITE's are critical to promote innovation, create new business, transfer technology into the productive sectors to increase the industrial capabilities and output in key strategic sectors of the country. A successful network of CITE's will translate in greater industrial output, increase demand for a specialized labor force and a larger tax revenue basis for the government. CITE's should be fully funded by the government for at least five years with some cost sharing support for IA's from the universities and research institutes. It is recommended that Universities contribute to a 5-10% of the cost of IA's working in CITES where the University is a member. As CITE's becomes successful, reliance on government funding should gradually decrease. It is recommended that 20% of revenues generated from licensing and spinoff activities is retained by CITE. Continued financial support of CITES from government funding agencies will be subjected to achieve certain milestones during the first five-year period.

Short-term milestones to be accomplished during the first year include:

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1. Recruit at least one Executive Director and two Innovation Agents (six months)
2. Arrange training in the US for at least five Innovation Agents (six months)
3. Recruit and train at least two Patent Agents (eight months)
4. Establishment of a database system (network) for all present and future invention disclosures, patent applications, licensing etc. (12 months)
5. Set up system to follow up on all existing invention disclosures, patent prosecution and licensing activities (12 months)
6. Establishment of a web site with searching capabilities regarding IP activities of all CITES (12 months)
7. Set up financial, legal and administrative support system linked to all CITES (eight months)
8. Organize at least three Technology Fairs with participation of universities, industry, incubators, private funding (Angels, VC etc) (12 months)
9. Organize workshops to introduce CITE's capabilities' and discuss IP and COI policies (six months)
10. Established appropriate linkages with international Technology Transfer Offices or other organizations such as AUTM and others (12 months)
11. Establish contact with at least 50% of universities PI's conducting research and prepare a list of possible invention disclosures to follow up (10 months)
12. Complete list of possible invention disclosures from all PI's (12 months)
13. Identify potential licensees for patents issued and filed (12 months)
14. Organize inventors contest

Milestones to be accomplished by year three are:

1. Complete establishment of CITES
2. Complete recruiting of Directors, Innovation Agents and Patent Agents (18 months)
3. Complete training of Innovation Agents in the US (24 months)
4. Provide quarterly reports of IP activity (invention disclosures, patent applications, prosecution, licensing, spinoff etc)
5. Secure filing of 50 patents in Chile and international (24 months)
6. Initiate discussions for up to 15 licensing and/or creation of 3 spinoffs (18 months)
7. Complete at least 10 licenses and the creation of at least 2 spinoff (24 months)
8. Organize at least four Technology Fairs with participation of universities, industry, incubators, private funding (Angels, VC etc) (24 months)
9. Organize eight workshops on entrepreneurial support to faculty (36 months)
10. Organize two inventors contests (18 months)

Milestones to five years consist of:

1. Secure necessary funding for CITE for 36 months
2. Complete 25 licenses in Chile and international (48 months)
3. Secure filing of 350 patents in Chile and international (60 months)
4. Create eight spinoff companies with secured funding for at least two years (60 months)
5. Organize 12 Technology Fairs with participation of Angels, VC and industry (60 months)
6. Organize 13 workshops on entrepreneurial support to faculty (60 months)

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Finally, assuming that funding has been secured and that there are sufficient universities interested in participating, the following actions are required for launching a successful CITE program:

1. Identify a consultant group to assist in the launching of the program (one month)
2. Establish Oversight Committee (one month) and hire a senior and experienced person to lead the launching of the program
3. Work with interested Universities through the process of application to join CITE and harmonization of their IP and COI policies
4. Establish training program for IA and PA with at least 3 universities in the US (three months)
5. Identify and hire at least one CITE Director and 2 IA plus support personnel (five months), and
6. Establish CITE Support Office (six months)

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ABBREVIATIONS AND ACRONYMS

AUTM	Association of University Technology Managers
CCTEC	Cornell Center for Technology Enterprise and Commercialization
CFR	Code of Federal Regulations
CITE	Centres for Innovation, Technology Transfer and Entrepreneurship
CNIC	National Innovation Council for Competitiveness *(Consejo Nacional de Innovación para la Competitividad,*
CODELCO	*Corporación Nacional del Cobre*
COI	Conflict of Interest
CONICYT	*Comisión Nacional de Investigación Científica y Tecnológica*
CORFO	Chilean Economic Development Agency *(Corporación de Fomento de la Producción)*
CPC	*Confederación de la Producción y del Comercio*
DICTUC	*Dirección de Investigaciones Científicas y Tecnológicas de la Pontificia Universidad Católica de Chile*
FIC	National Innovation Fund For Competitiveness *(Fondo de Innovación para la Competitividad)*
FONDEF	Fund for the Promotion of Scientific and Technological Development *(Fondo de Fomento al Desarrollo Científico y Tecnológico)*
FDF	Foundation of Desarrollro Fruta
IA	Innovation Agent
ILB	InterLink Biotechnologies
INAPI	Chilean patent agency
INIA	Agriculture and Livestock Institute
INNOVA	Innovation Committee of CORFO
IP	Intellectual Property
ISI	Information Sciences Institute
MECESUP	*Mejoramiento de la Calidad de la Educación Superior*
NIIP	National Institute of Industrial Property
NIS	National Innovation System
OECD	Organization for Economic Cooperation and Development
OED	Office of Enrollement and Discipline (located within the USPTO)
OTRI	Oficina de Transferencia de Resultados de Investigación
PA	Patent Agent
PCT	Patent Cooperation Treaty
PRO	Public Research Organization
PSU	*Pruebas de Selección Universitaria*
R&D	Research and Development
ROI	Return on Investment
SMEs	Small and medium enterprises
TTO	Technology Transfer Offices
UOC	University Oversight Committee on Conflicts
USPTO	United States Patent and Trademark Office
WIPO	World Intellectual Property Organization

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CHAPTER I
ASSESSMENT OF UNIVERSITIES TECHNOLOGY TRANSFER PROGRAMS

1. Intellectual Property (IP) and Conflict of Interest Policies (COI)

Only a few Chilean universities have established practices to identify valuable IP as a result of their research activities. In general IP protection is not encouraged or rewarded among faculty and it is not an important component of the present university strategy. Moreover, a number of Chilean universities do not have established policies regarding IP ownership and distribution of revenues and lack policies concerning conflict of interest. To successfully move discoveries into commercialization, it is required to have in place formal mechanisms and policies regarding IP and COI. These must be coupled with proper incentives to faculty, training activities in Technology Transfer and by fostering an entrepreneurial culture among faculty. This should be an important component of the present universities strategy.

2. Offices of Technology Transfer

Although Chilean universities and other research state organizations develop much of the new science and technology, universities have not aggressively converted scientific and technological discoveries and breakthroughs into innovative business opportunities or commercialization. A few offices of technology transfer or similar type organizations have been established in Chile OTRI Chile, NEOS, DICTUC and a few within universities). In general, their output measured in filed and awarded patens has been limited and their IP marketing capabilities are not evident. This in turn has meant no significant spinoffs, licensing or joint ventures. A more detailed analysis of their operation and output s discussed in Chapter III.

Government funding agencies have put in place few mechanisms to support and fund IP protection and Technology Transfer activities (INNOVA, MECESUP, FONDEF). Government agencies should be encouraged to continue their support in the following areas:

1. Training of Technology Transfer personnel
2. Support outreach programs
3. Provide incentives to industry for licensing university technology
4. Facilitate access to risk capital
5. Mechanisms to facilitate access to databases & information (IP, marketing)

3. Patenting and Licensing Activities

During the period from 1996 through 2007 certain Chilean Government funding agencies (CONICYT, FODEF, CORFO, FIA) invested US $951,212 million in R&D in Chilean Universities. An additional US $941,122 million were invested in other Chilean research organizations. This represents an average investment through the period of $157,686 million dollars per year. During the last few years R&D investment has steadily increased and it estimated that presently Chilean universities and research institutes spend approximately $ 216 millions in R&D per year. This initial investment is now generating a steady flow of research results that requires an effective management of the intellectual property being created that could be transferred to the productive sectors or used to create new business opportunities. It has been generally recognized and corroborated by the observations of ILB, that within the Chilean

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university system there is a culture that promotes academic research coupled with significant government funding. A fine track record of publications has been established by many of the scientists, showing 8,072 ISI publications from 2006 through April 2009. This represents 2,421 ISI publications per year. During the last few years ISI publication have increased substantially reaching more than 3,000 per year. Traditionally, academics have focused on the generation and dissemination of knowledge for the greater good not always with significant thought given to the opportunities for practical and commercial applications.

Universities have not kept pace with the steady output of scientific results being generated. Between 1996 and 2009, Chilean universities applied for 371 patents mostly in Chile (26 international) of which 38 have issued. Approximately one half of the patents were filed between 2005 and 2009. Based on these figures and compared with prior adjustment to developed countries like the US where 35 patents are filed for every $100 million spent in RD, Chile is operating under 30% capacity in this field (11 patents filed for every $100 million). Considering only international patents the figure is 0.7 patent files for every $100 million (less than 3% capacity)

Licensing activities and the creation of spinoffs as a result of university inventions during the last 10 years has been limited. ILB could not obtain reliable figures, but based on information obtained from some universities and technology transfer organizations only a few patents were licensed during the period and only a handful of new companies were created. Considering that during the last 12 years Chilean universities and other research institutes received in excess of US $2 billion in R&D from the government, the output in IP and business creation seems inadequate and discouraging as a mechanism for strong economic development.

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CHAPTER II
INTELLECTUAL PROPERTY AND CONFLICT OF INTEREST POLICIES

Introduction

The primary obligation of Universities in conducting research and scholarly activities is the pursuit of knowledge for the benefit and use of society. Although university research is not directed intentionally toward inventions, valuable inventions do often result as result of research conducted by faculty, staff, students, and others.

Chilean universities depend primarily on financial support from governmental agencies to conduct their research activities. University IP should be transferred to the marketplace to realize its full benefit to society. This can be best achieved by providing the university with ownership of the inventions and related intellectual property resulting from its research and to administer the IP in the most efficient manner for the benefit of society.

University faculty has a primary professional allegiance to the university. Faculty's primary commitment of time should be the education, research and scholarship activities of the university. As a result of this, faculties have an obligation to conduct the affairs of the university in a manner consistent with those purposes and to make all decisions solely on the basis to promote the best interests of the institution.

Faculty and employees (deans, directors, staff) have a primary commitment to the university and they should be sensitive to the possible adverse effects of their external activities. Participation in extramural activities may enhance the quality of teaching research and administration of university programs, provided the primary commitment to the university is not adversely affected.

Appropriate policies should be in place to allow university members to identify, evaluate and correct or remove real, apparent and potential conflicts of interest and commitment. Disclosure of outside activities by faculty members is an essential step in any policy regarding conflicts of interest or commitment. Faculty must disclose to the university whether they (or members of their immediate family) have consulting or employment relationships with and/or significant financial interest in an outside entity before the university will approve arrangements between the entity and the university.

The following sections provide templates for harmonized Intellectual Property and Conflict of Interest policies.

1. Intellectual Property Ownership Policy

Introduction

The university recognizes that for basic and applied research and other scholarly activities of its faculty, staff, students, and others, it depends on financial support from governmental agencies, private foundations, corporations operated for profit, and others. Thus, it is in the best interest of the university and the public for the university to administer any inventions and related property rights arising from research, scholarly, and other university activities.

The transfer of the university inventions to the marketplace, the publication and availability for educational purposes of the fruits of such inventions, and the achievement of a fair and equitable

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distribution of net license revenue, which acknowledges both the contribution of the inventor and the university, can best be assured by providing the university with ownership of the university inventions and related intellectual property.

This policy pertains to an invention, a novel creation, discovery, and/or idea that may be protected by patent, plant variety protection certificate, plant breeder's right, international treaties, or similar international, intellectual property rights. This policy does not pertain to issues of copyright ownership. However, in those instances where a university invention may be protected both by copyright and patent rights, this policy shall take precedence.

1.1 Ownership of Inventions

The university owns all inventions made by an individual with (i) a university appointment in furtherance of his/her university responsibilities, and/or (ii) with the use of university resources, including those provided through an externally funded grant, contract, or other type of award or gift to the university.

If the university Office of Intellectual Property and Technology Transfer or other agency designated by the university determines that an invention was made by an individual on his/her own time and unrelated to his/her university responsibilities and was conceived or reduced to practice without the use of university resources, then that invention belongs to the individual inventor.

Written disclosure is required for all inventions to the university Office of Intellectual Property and Technology Transfer or other agency designated by the university, which will determine ownership in accordance with the terms of this policy. If the university Office of Intellectual Property and Technology Transfer or other agency designated by the university determines that the university has an ownership interest, the inventor must assign all rights and titles of the invention to the university or its designee, and cooperate and assist the university or its designee in all phases of the management process. Disputes regarding ownership determination may be appealed to the Board for Dispute Resolution, whose decision will be final.

In cases in which the university has an ownership interest in a university invention or related property rights and the university or its designee has not pursued any form of commercialization within one year of receipt of a completed Invention Disclosure Form, the inventor who intends to pursue commercialization of the university invention may request in writing that all university rights in such university invention be reassigned to the inventor. To the extent the university invention is not subject to any sponsored project rights or restrictions, and provided that all other co-inventors, if any, of the subject university invention consent to the request, the university Office of Intellectual Property or other agency designated by the university shall reasonably consider such a request. Any reassignment of rights by the university to the inventor of a the university invention shall be limited only to the substance disclosed in the Invention Disclosure Form officially on record at the university Office of Intellectual Property and Technology Transfer or other agency designated by the university and further subject to the university reserving the rights to use the subject invention for research and educational purposes.

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Research funded wholly or in part by an outside sponsor is subject to this policy as modified by the provisions of the agreement covering such work. The provisions of the agreement between the university and the sponsor bind employees engaged in sponsored research. Title to any inventions conceived or first reduced to practice in the course of research supported by government agencies, industry, or other sponsors shall generally vest in the university. In rare cases, an industrial sponsor may possess a dominant patent position in a certain technology area so that any patent the university might seek would be of little or no value. For this or other reasons, the Vice President of Research may approve an exception to the university title policy when to do so will honor the general principles of this policy, protect the equities involved, and satisfy the requirements of the parties.

Industry supported research is valued by the university when it embraces a proper balance between the university's educational mission and industry's quest for the development of commercial products, processes, and services. Interaction with industry may take any of several forms, including grants, contracts, consortia agreements, and affiliate programs. Industry sponsors may be assured of at least a non-exclusive license to inventions conceived or developed with their support. Where the sponsor uses the invention entirely within its own operations, the license may be royalty-free. Where the sponsor, or a third party, manufactures and sells products, services, or processes based on the invention, reasonable royalty payments to the university, or its assignee, are required. If necessary for the effective development and marketing of a university invention, an exclusive license may be granted. Where an invention is not identifiable in advance, the university may grant the sponsor an option to an exclusive license if the sponsor agrees to finance the cost of the university's patent application and observe certain diligence requirements that will assure promptly bringing the invention into public use. The patent financing may be treated as an offset against royalties payable when the invention is marketed.

If a public institution, the university should undertake sponsored research only when the results can be published. Publication may be deferred for a reasonable time (30 to 45 days) during which the university and the sponsor review the feasibility of patent coverage or other protection on an invention described in the publication. Likewise, graduate student theses or dissertations containing invention details may be withheld from the library shelves for a limited period while this evaluation process is conducted. Some research agreements may involve university access to a sponsor's proprietary data subject to a clause defining the conditions under which such data will be identified, accepted, and used. Students should be able to participate in such research in a meaningful way without access to proprietary data. When publication of the research involving proprietary data is contemplated, the university may agree to provide the sponsor with advance copy prior to submission for publication to allow the sponsor an opportunity to identify any inadvertent disclosure of proprietary data.

2. Template for Harmonized Intellectual Property Policy

2.1. Licensing University Inventions

The university Office of Intellectual Property and Technology Transfer or other agency designated by the university may negotiate a license to a university invention and related

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property rights to promote the likelihood that the university invention will provide a benefit to the public and the university. The license will generally cover nonrefundable license fees, patent expense reimbursement, royalty and minimum royalty payments. If the licensee does not take effective steps within a reasonable time to achieve practical application of the university invention, the university maintains the right to grant a license to another licensee upon terms reasonable under the circumstances.

2.2. Procedures

2.2.1. Signing the Acknowledgement Form

Each individual receiving a university appointment to an academic position, including clinical and affiliation appointments and those with modified titles (visiting, adjunct, courtesy, etc.), graduate students appointed on research assistantships, graduate research assistantships, fellowships, and training grants, and certain nonacademic positions as may be designated by the Vice President of Research, must execute the "Invention and Related Property Rights Acknowledgement" form, acknowledging awareness of the terms of this policy. Initiation of the university appointment requires completion and submission of this form.

2.2.2. Disclosing Inventions

All inventions made by individuals with a university appointment and/or with the use of university resources must be disclosed promptly in writing to the university Office of Intellectual Property and Technology Transfer or other agency designated by the university, using the Invention Disclosure Form. Such disclosure will include documentation to fully describe the invention's prior art, and the potential utilization. The university Office of Intellectual Property and Technology Transfer or other agency designated by the university will then determine whether the invention is a university invention.

2.2.3. Evaluating and Protecting Inventions

The university Office of Intellectual Property and Technology Transfer or other agency designated by the university will evaluate all disclosed inventions for their commercialization potential and determine the appropriate means for protecting and promoting the development of the invention. Inventors will cooperate with the university or its designee in the university's effort to evaluate and protect university inventions.

When a patent application has been authorized by the Vice President of Research on a disclosed invention, the university Office of Intellectual Property and Technology Transfer, or other agency designated by the university, will work with the inventors to prepare a patent application. Inventors are required to provide a reasonable level of assistance in this process. Patent applications are filed in the name of the university. The university Office of Intellectual Property and Technology Transfer or other agency designated by the university, is responsible for responding to any requests for further information from a foreign patent office or Instituto Nacional de Propiedad Industrial (INAPI).

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2.2.4. Distributing License Revenue

In the case of a university invention, the university, through the university Office of Intellectual Property and Technology Transfer or other agency designated by the university, will receive all license revenue and distribute total net license revenue as follows:

1) 80 percent to be divided as follows: (a) 35 percent to the university inventor(s) in recognition of the inventor contribution. In the case of university co-inventors, this distribution will be shared, and (b) 25 percent to the inventor's research budget, subunit (typically the inventor's department, school, section, or center) and 20 percent to the university unit (typically the inventor's college) in a manner to be determined by the dean of the unit (or, for research centers in the Vice President of Research)

2) 20 percent to the university to provide the university Office of Intellectual Property and Technology Transfer or other agency with operating funds to cover the cost of service provided to the university with regard to intellectual property matters and particularly to cover direct costs, where license revenue or other cost recovery has not been achieved.

In the case of an irresolvable dispute over net license revenue distributions, such revenue will be distributed as determined by the Vice President of Research, whose decision will be final.

2.2.5. Distributing Equity Revenue

Proceeds from the liquidation of equity received by the university Office of Office of Intellectual Property and Technology Transfer or other agency designated by the university will be distributed as license revenue in the manner described in "Distributing License Revenues," above.

2.2.6. Requesting Waiver of Provisions

Requests for a waiver of any of the provisions of this policy will be directed to the Vice President of Research. The request must identify which provisions of the policy are requested to be waived, the reasons why, and how the waiver would be consistent with the educational, research, or scholarly purposes of the university and the public interest.

Waivers relating to the distribution of net license or equity revenue, and which would affect the inventor's unit/sub-unit, require the approval of the dean or unit administrator from which the invention originated, prior to submission to the Vice President of Research. Consideration of each request is on its own merit with no implication for subsequent requests.

2.3. Definitions

2.3.1. Board for Dispute Resolution

Appointed and chaired by the Vice President for Research to resolve invention ownership disputes. If the Office of Intellectual Property and Technology Transfer or other agency designated by the university cannot resolve a dispute in invention ownership, the decision may be appealed to the Board for Dispute Resolution, whose decision is final.

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2.3.2. Invention Disclosure

A written description of an invention that enables a non-inventor to practice the invention, and which is accompanied by an Invention Disclosure Form (attached) to be filled out by the university inventor(s), signed and submitted to the Office of Intellectual Property and Technology Transfer or other agency designated by the university.

2.3.3 Invention and Related Property Rights Acknowledgment Form

The Invention and Related Property Rights Acknowledgement Form must be signed by each individual receiving a university appointment to an academic position, acknowledging awareness of the university Intellectual Property Policy.

2.3.4. Office of Intellectual Property and Technology Transfer

Established and appointed by the Vice President for Research to provide advice and counsel on all matters related to intellectual property and the management of technology of the university. The university may work with a third party agency or organization to manage and meet its Intellectual property objectives.

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INVENTION DISCLOSURE FORM

I. Title of Invention

_____
_____

II. Brief Description of Invention*

_____
_____
_____
_____
_____
_____
_____
_____

*For a complete description please include an Attachment with the following:

1. Background of the Invention and Related Technologies (the problem the invention solves)
a. Are there existing products that address the same problem that the Invention solves? Please name and describe them.
b. List all relevant publications, patents and competing inventors or labs that you are aware of.
2. Unique Features of the Invention
a. List all of the features that distinguish the Invention over the Related Technologies.
3. Detailed Description of the Invention including:
a. How to make and use the Invention
b. Best mode of making the Invention
c. Drawings or pictures of all aspects of the Invention
4. Possible alternative versions of the Invention
5. Probable uses of the Invention

III. Funding and/or Sponsorship: Please include all outside agencies, foundations, organizations, or companies and the applicable contract or grant number(s) that provided funding to any inventor for the research that led to the invention. Please also include any companies that have supplied materials in exchange for intellectual property rights. (If there is no funding or sponsorship, then mark None.)

None _____
Government _____
Commercial/Private_____
University _____
Personal _____
Other _____
Name of Sponsor _____

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Sponsor Project No. _____
Was any third party Software included in the invention?

If yes, please provide the information on the source of the third party Software and any constraints on its use in the current invention.

_____

IV. Record of Invention (If no information is available, then mark None.)

1. Date of Conception: _____Documented? Yes____ No_____
   Form and location of documentation:

_____

2. Invention Reduced to Practice? Yes____ No_____

Date of First Reduction to Practice: _____Prototype Available? Yes____ No_____

V. Publication(s): Please provide a copy of all materials disclosed in any of the following forms. (If no information is available, then mark None.)

Article Submittal: Date: Journal: Publication Date: Estimated or actual

_____

Oral Disclosure: _____ Date: Occasion: Handouts? YES ___ NO __Thesis: Date:_____
News Release: Date: _____ Publication: _____
Web Site: _____ Date: _____ URL: _____
Discussion with Industry Representatives: _____ Date: _____Venue: _____
Poster presentation: Date: _____ Occasion: _____
Published Abstract: _____ Citation: _____

VI. Commercial Interest: Please list the specific contacts if you have them, or simply list some companies that are the type of company that you think might be interested in this invention. (If no information is available, then mark None.)
Company City Contact Person Title of Contact Person

_____
_____
_____
_____

VII. Inventor Information Section: List all probable inventors. If you are not sure whether a collaborator should be listed as an inventor, please list their contact information in Section VIII below for the university Office of Office of Intellectual Property and Technology Transfer or other agency designated by the university to evaluate. Please remember that inventorship is not the same as authorship on a scientific paper. An inventor is someone who contributed

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intellectually to the conception of the invention or to the reduction of the invention to practice. Neither funding a project nor performing routine lab work as a "pair of hands" is sufficient to qualify someone as an inventor.

Name of Primary Contact:
Inventor Data (1)
Name: _____ Title: _____
Department: _____ Division: _____
Campus Address: _____
Campus phone: _____ e-mail: _____
Home Address: _____
Country of citizenship: _____ Home phone:_____

Inventor Data (2)
Name: _____ Title: _____
Department: _____ Division: _____
Campus Address: _____
Campus phone: _____ e-mail: _____
Home Address: _____
Country of citizenship: _____ Home phone:_____

Inventor Data (3)
Name: _____ Title: _____
Department: _____ Division: _____
Campus Address: _____
Campus phone: _____ e-mail: _____
Home Address: _____
Country of citizenship: _____ Home phone:_____

Inventor Data (4)
Name: _____ Title: _____
Department: _____ Division: _____
Campus Address: _____
Campus phone: _____ e-mail: _____
Home Address: _____
Country of citizenship: _____ Home phone:_____

*Note: If there are more than four inventors, please provide additional information on a supplemental sheet.

VIII. Collaborator Information/Institution/Company/Organization: If you are not sure whether a collaborator should be listed as an inventor, please list them here for university Office

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of Office of Intellectual Property and Technology Transfer or other agency designated by the University to evaluate. (If there was no collaboration, then mark None.)
Institution/Company/Organization Principal Investigator Name Address/Email

_____
_____
_____
_____

IX. University Inventor Signature(s): Per the University Invention and Related Property Rights Policy, I (we) hereby assign all right, title, and interest in and to this invention to the University ("the University") and agree to execute all documents as requested to assign my (our) rights to the University in and to any patent application or other statutory form of intellectual property protection filed in connection with this disclosure, and to cooperate with University Office of Office of Intellectual Property and Technology Transfer or other agency designated by the University in securing protection of the disclosed invention.

I (We) hereby declare this invention disclosure is complete and accurate to the best of my (our) knowledge.

Inventor Signature Date Witness Signature Date

(1) _____

(2) _____

(3) _____

(4) _____

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INVENTION AND RELATED PROPERTY RIGHTS ACKNOWLEDGEMENT

The full text of University Intellectual Property Policy is available at the University Office of Intellectual Property and Technology Transfer or other agency designated by the University. The policy includes the following provisions:

1. That any invention or discovery made in furtherance of my University responsibilities and/or with the use of University resources (including but not limited to the performance of a grant, contract, award or gift made to the University by any external agency), shall belong to the University, and be subject to the provisions of the Policy as amended from time to time.

2. That any discovery or invention be disclosed promptly in writing to the University Office of Intellectual Property and Technology Transfer or other agency designated by the University.

3. That license revenue is shared between the University and inventors in accordance with the revenue distribution section of the Policy.

I have read and understand the above.

Signed:_____

Date:_____

Printed Name:_____

Position Title:_____

Department:_____

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3. Template for Harmonized Conflict of Interest Policy

Background

Faculty and staff members of a university have a primary professional allegiance to the university, and their primary commitment of time should be the education, research and scholarship activities of the university. Accordingly, the faculty and staff of the university community have a clear obligation to conduct the affairs of the university in a manner consistent with those purposes and to make all decisions solely on the basis of a desire to promote the best interests of the institution.

Faculty and other employees (deans, directors, staff) who accept full-time appointments have a primary commitment to the university and that they will be sensitive to the possible adverse effects of their external activities. Participation in extramural activities by faculty and other employees may enhance the quality of teaching research and administration of university programs, provided these primary commitments to the university are not adversely affected.

These policies and procedures will permit members of the faculty, staff and administration to identify, evaluate and correct or remove real, apparent and potential conflicts of interest and commitment. Disclosure of outside activities by faculty, staff, directors, deans and board members is the first essential step in this policy. Faculty must disclose to the university whether they (or members of their immediate family) have consulting or employment relationships with and/or significant financial interest in an outside entity before the university will approve arrangements between the entity and the university: Gifts, sponsored projects, technology licensing agreements and certain procurements. On an annual basis all faculty must certify to their school deans their compliance with the policies of the university with respect to conflict of interest.

3.1 Categories of Conflicts

A university thrives when its faculty and staff pursue and support research and scholarship with vigor. Their activities must include interactions with many external agencies. Predictably, some external relationships will have the potential to create conflicts of interest or commitment, or the appearance thereof. Disclosure of these relationships can often resolve apparent conflicts. Actual conflicts fall into two categories.

A conflict of interest may arise when a member has the opportunity to influence the university's business, administrative, academic or other decisions in ways that could lead to personal gain or advantage of any kind.

A conflict of commitment arises when a member undertakes external commitments which burden or interfere with the member's primary obligations and commitments to the university.

3.1.1 Conflict of Interest

A faculty member, or other employee, has a conflict of interest when he or she or any of his or her family or associates (to his or her present knowledge) either: (i) has an existing or potential financial or other material interest which impairs or appears to impair the individual's

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independence and objectivity of judgment in the discharge of responsibilities to the university; or (ii) may receive a financial or other material benefit from knowledge of information confidential to the university.

The family of an individual includes his or her spouse, parents, siblings, children and any other blood relative if the latter resides in the same household. An associate of an individual includes any person, trust, organization or enterprise (of a business nature or otherwise) with respect to which the individual or any member of his or her family (i) is a director, officer, employee, member, partner, or trustee, or (ii) has a significant financial interest or any other interest which enables him or her to exercise control or significantly influence policy.

Appendix 1 details examples of possible conflicts of interest.

3.1.2 Faculty and Staff Responsibilities

Faculty who accept full-time appointments have a primary commitment which includes meeting classes, being available to students and colleagues outside the classroom, serving departmental, college, and university committees, conducting research, publishing scholarly works, and otherwise meeting the changing needs of the university. Faculty members must not allow other professional activities to detract from their primary allegiance to the university. Faculty members must foster an atmosphere of academic freedom by promoting the open and timely exchange of results of scholarly activities.

Although a specific work-week is not defined for faculty members, it is expected that such membership constitutes a full-time obligation. Other employment is not allowed, except for consulting work.

Consulting work is important for faculty to remain in close communication with people and organizations outside the university, especially in their area of specialization. While consulting activities often enhance a faculty member's value to the university, it can result in conflicts of interest and conflicts of commitment that compromise the faculty member and the institution.

In private consulting, the faculty member clearly does not represent the university. Private consulting activities of faculty members must be viewed in relation to their overall responsibilities to the university, and should not become so extensive that they interfere with those responsibilities.

Full-time faculty members must inform their department chairpersons of all plans to do private consulting for which they receive compensation. Unless the regular duties include consulting services to the public, each full-time professor may engage in private consulting work, provided such work, in the judgment of the department chairperson and in accordance with the principles stated above, enhances the value of the individual to the university and does not interfere with regular university duties. Faculty members may not use university resources, including facilities, equipment or confidential information as part of outside consulting activities or for any other purposes that are unrelated to the education, research, scholarship and public service missions of the university.

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Faculty must disclose in a timely fashion the creation or discovery of potentially patentable inventions created or discovered in the course of their use of university activities or with the use of university resources.

Staff members have more explicitly defined commitments of time and expectations reducing the likelihood of conflicting external activities. Nevertheless, the university expects that staff members also will recognize the possibility that their external activities, commitments and interests may have adverse effects on the performance of their university obligations.

Faculty and staff members who hold part-time appointments commonly will have major obligations and commitments, not only to the university, but also to one or more outside agencies. The potential for conflict may be considerable. Accordingly, part-time employees must exercise special care in disclosing and fulfilling their multiple obligations.

3.2. Conflict Disclosure and Avoidance of Conflicts

Members must evaluate and arrange their external interests and commitments in order to avoid compromising their ability to carry out their primary obligations to the university.

The exercise of individual judgment and discretion is important in resolving or avoiding conflicts.

Full disclosure of the circumstances surrounding a real or potential conflict is required prior to making the commitment or initiating the activity that poses the possible conflict.

3.2.1. Members of the Faculty and Staff of Instruction and Research

Disclosure should be made to the college or division in such form and manner as the dean or director may prescribe before undertaking the activity. The department chair or unit administrator may act as representative of the dean or director for the purpose of receiving and evaluating such information. Timely, detailed disclosure permits an accurate and objective evaluation of potential conflicts. Each member has an obligation to cooperate fully in the review of the pertinent facts and circumstances. The dean or director shall make a determination, which resolves and removes the conflict or appearance of conflict.

Appendix 2 provides a standard Disclosure Form.

Discussions with the unit administrator and/or the dean should include consideration of whether an individual's role in an external agency needs to be declared or made known to other members of the university community to protect confidentiality or to guard against the transfer of privileged information. If such disclosure is necessary, it should be made by the unit administrator to faculty and staff who may be affected.

3.2.2. Members of the Staff

Disclosure should be made to the college, division, or other administrative unit in which the member is employed in such form and manner as the Vice President, dean, or director may

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prescribe. Members involved in the following duties must be particularly conscious of possible conflicts or the appearance of such conflicts: the procurement, exchange or sale of goods, services or other assets, the negotiation or formation of contracts or other commitments affecting the assets or interests of the institution, the handling of confidential information and the rendition of professional advice to the university. Detailed disclosure permits an accurate and objective evaluation. Each member has an obligation to cooperate fully in the review of the pertinent facts and circumstances. The head of the college, division or department shall make a determination, which resolves and removes the conflict or appearance of conflict.

3.2.3. Deans and Directors

Deans and directors of the colleges, schools and units shall file an annual disclosure statement with the President regarding their own external commitments and interests in such form as the President may direct. The President shall resolve any matter involving a conflict or appearance of a conflict in such cases.

3.3. Resolution of Conflicts Involving Faculty and Staff of Instruction

3.3.1. Initial Disclosure Reveals Real or Apparent Conflict of Interest

In the event that disclosure reveals a real or apparent conflict, the dean, director or other authority designated by the dean or director shall review the facts and attempt to resolve the matter informally with the faculty or staff member.

In the event that the member objects to the resolution by the dean or director, the matter shall be referred to an Advisory Committee designated by the President.

3.3.2. Advisory Committee Resolution of Conflict Disputes

Most conflicts will be resolved through disclosure and review processes at the departmental, college or other subordinate level. However, if a conflict remains unresolved following earlier reviews, the dean, director or other designated administrator will submit the matter, together with a recommended resolution, to the President who shall appoint an Advisory Committee which shall include the Vice President of Research and two senior members of the faculty.

The Advisory Committee shall consider the matter, determine whether a conflict exists, evaluate the severity of the conflict, and recommend to the President the steps necessary to resolve the conflict. The President may accept, reject or modify the recommendations.

If the member disagrees with the President's determination, the member may request a further consideration of the matter and, in that connection, may examine the recommendations of the Advisory Committee, including supporting evidence, and offer other relevant information or explanations. The University Counsel shall serve as advisor to the President. Following such reconsideration, the President shall make a final and binding determination in writing.

If the determination requires the termination of the member's appointment, the procedure adopted by the Board of the University and University Faculty regarding such cases may be

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invoked by the member. That is, the President shall appoint a board consisting of five members of the University Faculty, of whom two shall be selected by the faculty members, two by the President and the fifth by the other four. The Board may modify the proposed remedy but shall have no authority to alter the determination of the President regarding the meaning, interpretation or applicability of the university Conflict of Interest Policy.

3.3.3. Resolution of Conflicts of Deans and Directors

Questions involving external commitments or interests of deans and directors shall be brought to the attention of the President, who shall resolve the matter.

3.3.4. Resolution of Conflicts for Other Staff

Questions involving external commitments or interests of employees, other than members of the faculty and staff of instruction and research, deans and directors and executive officers, shall be disclosed to the appropriate Vice President, dean or director, (hereafter "head") or their designee. In the event that disclosure reveals a real or apparent conflict, the head or designee shall review the facts and attempt to resolve the matter informally.

3.4. University Oversight Committee on Conflicts

A University Oversight Committee on Conflicts (UOC) shall be established which shall serve as a university resource with respect to matters involving the general subject of conflicts of interest and commitment, the oversight and implementation of the University Conflicts Policy, and the identification and resolution of specific conflicts of interest.

The standing UOC shall be chaired by the Vice President for Research, shall include not less than five additional members appointed by the President, and shall include faculty of the university.

The UOC shall oversee the solicitation of a periodic uniform disclosure (on an annual basis) from all university faculty (and such other members of the staff of instruction and research as are deemed appropriate by the UOC) that addresses potential conflict of interest and conflict of commitment situations.

The circulation, collection and retention of disclosure statements, including those disclosures presently required of non-academic staff will be the responsibility of the college dean or director or the head of the appropriate administrative unit, who shall provide the UOC with such summaries or reports or disclosure statements as it may require.

The dean, or director or head of the appropriate administrative unit in the case of non-academic staff, shall provide the UOC with a copy of any disclosure statement which reveals a real or apparent conflict of interest or commitment, together with a description of the resolution of such conflict or, if the conflict remains unresolved, the recommended resolution as submitted to the President.

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The UOC shall, at the request of the President, a college dean or director, or an appropriate administrative officer or a faculty or staff member, provide advice regarding a potential conflict of interest or commitment. If a faculty or academic staff member objects to a dean's or director's resolution of a conflict, the Advisory Committee appointed by the President shall seek the advice of the UOC.

The UOC shall maintain an ongoing awareness of college procedures, practices, and standards regarding conflict of interest and commitment, assuring consistency with the terms of the University Conflict of Interest Policy. The UOC shall communicate with college deans and directors or administrative officers to insure that its knowledge is sufficiently current and complete. It shall also insure that a proper balance is maintained between confidentiality and understanding of its operations and standards.

The UOC shall establish its own procedures consistent with this policy to carry out its various functions.

3.5 Definitions

3.5.1. Advisory Committee

The President may designate an advisory committee for the resolution of conflicts not resolved at the departmental, college or other subordinate level. This committee shall include the Vice President of Research and two faculty members. The Advisory Committee shall consider the matter, determine whether a conflict exists, evaluate the severity of the conflict, and recommend to the President the steps necessary to resolve the conflict. The President may accept, reject or modify the recommendations.

3.5.2. Significant Financial Interest

A significant financial interest is: a direct and significant economic interest; or economic holding or business transactions with profit-making entities including any kind of contract, whether it be of debt, employment, loan, purchase, sale mortgage, insurance or other contracts that can raise the conflict of interest issue; or economic interests in the form of stock, land partnership interest or inheritance. Significant financial interests shall be disclosed by an investigator when a proposal for a research project is submitted; by an investigator when a human subjects application is submitted; by an investigator prior to engaging in unsponsored, unfunded or similar research; by an investigator when a significant financial interest arises during the course of research; or by an inventor prior to the conclusion of a license transaction with a licensee.

3.5.3. University Oversight Committee on Conflicts (UOC)

The standing University Oversight Committee on Conflicts (UOC) shall be chaired by the Vice President for Research, shall include not less than five additional members appointed by the President, and shall include faculty of the university. The UOC shall serve as a university resource on conflicts of interest and commitment, the oversight and implementation of the University Conflict of Interest Policy, and the identification and resolution of specific conflicts of interest.

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CHAPTER III
MODEL FOR TECHNOLOGY TRANSFER AND MARKETING OF INTELLECTUAL PROPERTY OF CHILEAN UNIVERSITIES: CENTERS FOR INNOVATION AND TECHNOLOGY TRANSFER (CITE)

Introduction

Technology transfer is a complex process and careful thought must be given to strategic and tactical issues to ensure that this becomes an activity of excellence with high probability of success. It is generally accepted that there is a real risk of distraction and disorientation of the program if the objectives and stakeholders of the process are not clearly identified and maintained as the primary focus of the process. Stakeholders of the technology transfer process include researchers, faculty, university administrators, investors (such as angel and venture capitalists), entrepreneurs and Chilean corporations. While all will benefit from a smoothly functioning technology transfer process, these individuals and organizations will have different goals, timelines and requirements. By identifying the focus for the technology transfer, complications arising from differing perspectives should be limited. ILB believes that being goal oriented in economic development and creation of new business will help the process to generate superior results. It is critical for success in promoting economic development through technology transfer to have the university stakeholders committed to the goal. This has to be accomplished by providing the proper incentives for their active participation and by fostering an entrepreneurial culture among faculty.

Based upon these considerations, ILB proposes the creation of **Centers for Innovation, Technology Transfer and Entrepreneurship (CITE)** to link the activities of several universities or research institutes and coordinate them with the investment community and productive centers.

1. CITE Objectives and Activities

ILB has identified two major objectives for a national technology transfer program. A new, more functional technology transfer program and organization will catalyze the continued growth and development of Chile enabling it to become a globally competitive country through maximizing the value of Chile's natural and intellectual resources and infrastructure.

These two major objectives for a national Chilean technology transfer program are:

1. To maximize the societal benefit of research results generated by Chilean universities and other non-profit research organizations, i.e. return on investment in research funded by taxpayers; and

2. To act as an engine for economic development by developing and fine tuning innovative businesses with local and global applications, job creation and revenue generation

ILB believes that focusing on these goals is extremely important so that the available, limited resources of the Chilean education and research system will not be overstretched by other demands on technology transfer efforts, such as acting only as a resource or revenue flow for

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the university or research institute scientists. Either of these distractions, while being fine goals in themselves, will compete with the main objectives of the initiative.
CITE activities include:

1. Maintain awareness and provide information regarding IP among university stakeholders:
   - Workshops, presentations, publications
   - Maintain records of sufficient detail for further evaluation of the process

2. Identify novel ideas and technologies that could be translated into commercial opportunities

3. Protect and Manage Intellectual Property:
   - Intellectual Property Services: Patent prosecution and management
   - Licensing

4. Linkage and outreach to industry and productive sectors:
   - Networking
   - Technology Fairs
   - Direct communication with productive and investment sectors

5. Assistance to spinoff of new businesses:
   - Network with serial entrepreneurs
   - Establish strong venture capitalists and angels network
   - Identify and promote funding sources (state, region etc)
   - Linkage to technology parks and incubators

2. CITE Stakeholders

Four stakeholders in university technology transfer can be readily identified. These include:

- Universities and research institutes
- Government funding agencies
- Productive sectors, and
- Investment community

The relationship among these stakeholders is depicted schematically in **Figure 1**. With an effective flow of technology from the universities, all stakeholders will benefit financially. Stimulus funding in the form of grants from government funding agencies provide the universities with means to develop novel IP, which in turn, benefit productive sectors and the investment community through licensing and spinoffs. The resulting new businesses provide increased employment of Chilean scientists and engineers trained by the universities. Newly employed professionals and startup businesses promote economic development and increase tax revenue to the government. While this flow of resources and revenue seems self-evident, the key to the successful flow of grants, ideas, IP, licensing and products lies in the ability to identify IP and structure licensing deals that are fair to all parties. Three key specialized

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positions, the CITE Executive Director, Innovation Agent and Patent Agent are essential to the success of CITE functions. These positions are described in the following three sections.

3. Profile of Specialized Personnel

3.1. Executive Director - Technology Transfer Office

The goal of the Executive Director is to establish a TTO in Chile and work closely with universities, government funding agencies, key industries, incubators, venture capital and entrepreneurs to promote access to and licensing of intellectual property from the universities.

The director will lead a CITE in Chile that will support several local universities. The individual must be self-motivated with a proven track record in leading technology transfer activities in universities. See Chapter IV for detailed Position Description

3.2. Innovation Agent (IA)

The IA is a critical position within the CITE. This individual must have both a strong scientific as well as business background, preferably post graduate degrees, and be capable of recognizing opportunities at the scientific level for market applications. The scientific background of the IA should preferably be in a defined field that serves as an internal champion for promoting entrepreneurship and innovation from within the university. The latter requires an ability to interact effectively with faculty members, technology developers, productive sectors and the investment community. Additionally the individual must be able to structure reasonable business deals (spinoffs, licenses etc.) for beneficial partnership between the university and the production sectors and investment community. With such a demanding list of duties, it is essential that the individual be energetic and self-motivated.

The number of IA required for each CITE will depend on the funding level for the affiliated universities. Since at the present time it is difficult to have hard figures given that in the past filing patents has not been very active it is suggested to use the R&D support level of the faculty as a reference. The assumptions and estimates are presented in detail in **Section 4 Funding, Personnel and Deal Flow**

3.3. Patent Agent (PA)

A third important position in the CITE model is the Patent Agent (PA). This person would have the responsibility:

- To *rapidly* translate an invention disclosure into a US provisional application
- To work directly with the faculty-inventor to review the prior art,
- To suggest changes in experiments to enhance the novelty of the proposed invention and
- To craft the patent application and draft claims before it is sent out to the contracted IP law firm.

The presence of a PA addresses several recurring problems in Chilean universities. First, faculty-inventors are under pressure to publish their research findings and to have their students present and publish their research. The PA can solve this problem by rapidly turning an

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invention disclosure into a US provisional application in as short a period as one to two days at a very low cost. Second, the faculty inventor may be faced with prior art that can be discovered during an initial review of the invention disclosure by the PA. Working with the faculty-inventor, the PA may suggest additional experiments to perform or simple wording changes in the disclosure document to overcome the prior art. A more complete description of this latter process can be found in Chapter VI **Section 2. Patent Filing and Prosecution**.

In the US, a practitioner may either be a patent attorney or patent agent. Both patent attorneys and patent agents have the same license to practice and represent clients before the Patent Office, part of the United States Patent and Trademark Office (USPTO). Both patent agents and patent attorneys may prepare, file, and prosecute patent applications. Patent agents and patent attorneys may also provide patentability opinions.

In order to be registered as a patent agent or patent attorney, one must pass the USPTO registration examination. This exam, commonly referred to as the "patent bar," tests a candidate's knowledge of patent law and USPTO policies and procedures as set forth in the Manual of Patent Examining Procedure. Upon successful completion of the examination, one will be labeled as a "patent attorney" if he/she has already been admitted to a state or territorial bar. However, engineers, scientists and any other science based majors, as well as law students and law graduates who are not admitted to a bar, will be labeled as "patent agents" since they cannot give legal advice nor represent clients in court.

Generally, applicants who are not United States citizens and do not reside in the U.S. are not eligible for registration except as permitted by 37 CFR § 11.6(c). This regulation allows Chilean citizens working as PA in Chile to be registered and practice as US agents. Section 37 CFR § 11.6(c) states:

> Any foreigner not a resident of the United States who shall file proof to the satisfaction of the OED Director that he or she is registered and in good standing before the patent office of the country in which he or she resides and practices, and who is possessed of the qualifications stated in § 11.7, may be registered as a patent agent to practice before the Office for the limited purpose of presenting and prosecuting patent applications of applicants located in such country, provided that the patent office of such country allows substantially reciprocal privileges to those admitted to practice before the Office. Registration as a patent agent under this paragraph shall continue only during the period that the conditions specified in this paragraph obtain. Upon notice by the patent office of such country that a patent agent registered under this section is no longer registered or no longer in good standing before the patent office of such country, and absent a showing of cause why his or her name should not be removed from the register, the OED Director shall promptly remove the name of the patent agent from the register and publish the fact of removal. Upon ceasing to reside in such country, the patent agent registered under this section is no longer qualified to be registered under this section, and the OED Director shall promptly remove the name of the patent agent from the register and publish the fact of removal."

A candidate must also have an adequate scientific and technical background or education to understand a client's invention. The educational requirement can be met by a bachelor's degree

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in a specifically enumerated major, such as Biology, Computer Science, Chemistry, Biochemistry, Microbiology, Physics, and Biomedical, Chemical, Civil, Electrical, or mechanical engineering. This is known as Category A qualification. One can also meet the scientific and technical training requirement by qualifying under Category B[27] or Category C. Category B provides four distinct qualification options. Each option sets a requisite number of semester hours in physics, biology, chemistry, computer science, or engineering. One can qualify under Category C through a showing that he or she has taken and passed the Fundamentals of Engineering (FE) examination. Specific details of the ways in which one can qualify for the USPTO registration examination are outlined in the USPTO Registration Statement. Degrees in the social sciences, mathematics or philosophy by themselves do not meet this requirement.

4. Funding, Personnel and Deal Flow

An estimate of CITE staffing and productivity based upon Chilean funding of R&D at $100 and $300 mm USD per year is given in Table 2. CITE deal flow estimates were based upon the Association of University Technology Managers (AUTM) figure of $45 billion US R&D funding for the year 2006. This level of funding employed 1,800 people in technology transfer performing the activities and deal flow listed in Table 2. Breakdown of job responsibilities of the 1,800 persons was not available, so the information from CCTEC organizational chart (**Appendix 3**) was used to estimate the relative numbers of individuals serving in Technology Commercialization and Corporate Liaisons (51%), Intellectual Property Services (9%) and Operations and Finance (26%). These relative figures suggest CITE employ six persons in operations and finance, seven IA, and three PA for every $300 mm USD of R&D funding.

Based on ILB observations, at the moment Chile lacks a critical number of adequately skilled personnel that fits the IA profile. High priority must be given to a concerted effort to recruit (overseas if necessary) and train professional personnel in the field of technology transfer and entrepreneurial development. See Chapter IV for detailed Position Description. It is recommended that each CITE will have at least one PA and that there should be at least 1 PA for every 3 IA's.

At the level of staffing indicated in Table 1 and annual R&D support in Chile of $300 mm USD, it is anticipated that a fully functional CITE organization would process 126 invention disclosures and 106 US patent applications. Further, 33 licenses would be executed and another 84 managed. One would also expect five new products and four start-up companies to be generated. Finally, the ROI, as estimated from AUTM-Forbes 2006 is projected at 8.7%.

Given that the projections for deal flow are derived from the relatively mature technology transfer efforts of US academic institutions, it will of course take some time for Chilean technology transfer to reach these estimates. Exactly how long the CITE program will take to attain the more mature deal flow of US universities is uncertain and dependent upon several variables. First, the experience and dedication of the CITE Executive Directors, IA and PA are critical to the launch and growth of the model. Next, in no particular order are:

- The level of national R&D funding,

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- University support and encouragement of the faculty-inventor and
- Construction of pilot plant facilities.

Allowing between six months to one year for the identification and hiring of the first Executive Directors, IA and PA, the maturation process would be expected to continue for at least five to seven years to reach full maturity.

Table 1. Estimates of CITE staffing and deal flow

Variable	AUTM (2006)*	AUTM (2006)	Estimate CITE	Estimate CITE
R & D Funding ($mm)	$45,000	/$100	/$100	/$300
Employees	1800	4.0	5.4**	16
IA	-	-	2.7**	7
PA	-	-	1.0**	3
Operations & Finance	-	-	1.7**	6†
Activities				
Disclosures	18,874	42	42	126
US Applications (P+NP)	15,908	35	35	106
US Issued	3,255	7	7	22
Signed Licenses	4,963	11	11	33
Managed Licenses	12,672	28	28	84
New Products	697	1.5	1.5	4.6
Start-ups	553	1.2	1.2	3.7
Revenue ($mm)			$8.7#	$26.1

*www.autm.net

**Estimated from CCTEC organization chart in Appendix 3.

† Includes 1 IP manager, 2 administrative persons, 1 IT database manager, 1 accountant and 1 compliance manager after one year.

#Estimated from *AUTM-Forbes* 2006 with median university ROI of 8.7%.

5. Structure and Operation

The fundamental relationships of the **CITE** include one or several universities or R&D Institutes (grouped by geographic regions and/or productive sectors) properly linked to productive sectors, investment sources and facilities to start new business (see **Figure 1**).

5.2. Geographic Regions – 2 to 3 potential geographical regions.

5.3. Productive Sectors:

- Agriculture including Fruits and Forestry
- Nutrition (Processed Foods, Nutraceuticals and Swine & Poultry)
- Aquaculture
- Mining

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- Engineering
- Information Technology (IT)
- Biomedicine & Diagnostics
- Consortia (e.g. FDF and Intesal)

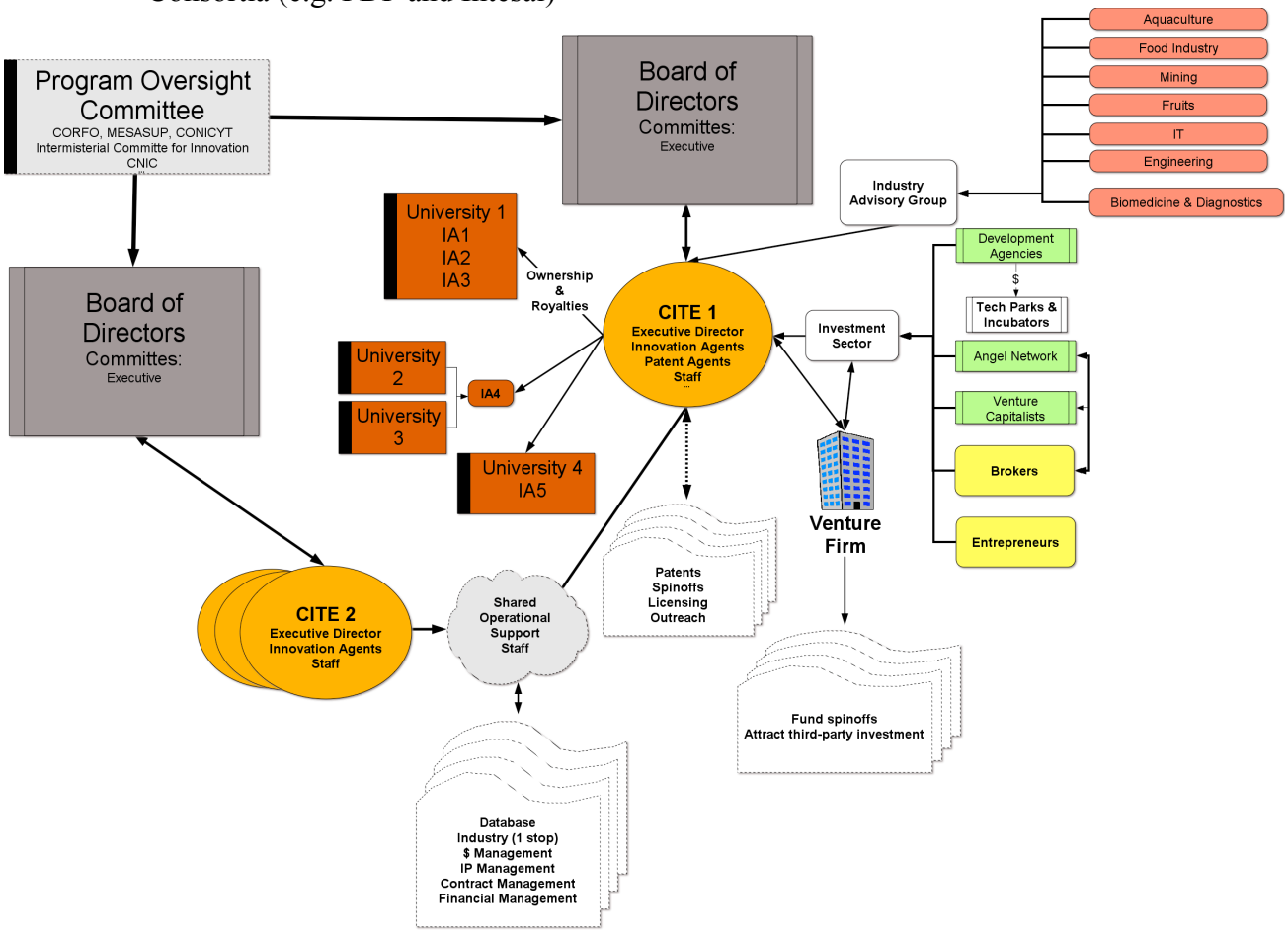

Figure 1. Schematic depiction of government, universities, productive sectors, and investment sectors linkage though Centers for Innovation, Technology Transfer and Entrepreneurship **(CITE)**.

5.3. Investment Sectors: This is a key component where the government must play an active role by funding or providing logistic support to CITE activities through:

- Development Agencies:
  - CORFO,
  - Department of Education (MECESUP)
  - CONICYT-FONDEF
  - Direct Government Support AFD
  - INAPI
- Angel Networks
- Venture Capitalists
- Tech Parks & incubators (funded by government and/or regions)

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5.4. Venture Capital Vehicle

An effective way to catalyze new businesses based on technology from universities affiliated with CITE could be the creation of a venture capital funding and business development vehicle. This vehicle could be a "Venture Firm" wholly owned by the universities and directly linked to CITES, research parks and business incubators. The "Venture Firm" will be the final piece of a comprehensive system of technology transfer and innovation. It is recommended that the 'Venture Firm" have an initial seed capital of $2 million to directly fund spinoffs and attract third party co-investment. The initial funding for the "Venture Firm" could be a commitment from a funding agency such as CORFO to make the funds available though a five-year period. Depending on interest from other private partners, the Limited Partner model for raising funds could also be considered. Given the typical size of a seed investment round and the expected relatively modest starting deal flow, the initial seed capital fund draw-down will be spread over a number of years and will not need to be immediately available.

The advantages of a Venture Firm can be summarized as follows:

- Combine public seed money and larger private venture funding elements through consortia; i.e. The CITE Venture Firm may lead deals involving a number of investors
- Incentive to identify new technologies and business through CITE to quickly create a robust portfolio of start up companies
- Access to very early technology with an opportunity to be involved with the business plan and early stage management
- Provide easy access opportunities for universities to have students participate in intern programs

6. CITE Linkages with Productive Sectors and Market (companies, startups, entrepreneurs, and international technology transfer organizations)

6.1. Central CITE

There are two significant linkages for the interaction of funding agencies, and productive and investment sectors with CITE – a CITE Shared Operational Support Office, and the CITE Board of Directors. Within the CITE Shared Operational Support Office, the Executive Director works closely with the IA and staff to foster communication with the Productive Sectors and Markets through networking, technology fairs and direct communication. Through the Committee on University-Productive Sector and Graduate Education Programs, the CITE Board of Directors can serve to:

- Identify general and specific requirements for the education process
- Adopt approved curricula, lobbying the government for funds to support faculty and as importantly the students,
- Monitor the progress of new initiatives against the stated goals for the programs and
- Introduce new procedures as the programs mature and their effects can be seen.

6.2. Shared Operational Support Office (CITE 1 of **Figure 1**).

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As previously described, each CITE will have an Executive Director and 3-6 IA plus support staff depending on the size of the operation. A CITE Shared Operational Support Office, however, would oversee shared activities common to all CITE such as database and financial management, patent and licensing management, and outreach programs. Essentially the CITE Shared Operational Support Office would become a "one-stop" shop for the productive and investment sectors interested in the latest IP developments at Chilean universities. Additionally, government funding agencies would interact with the Shared Operational Support Office CITE to access productivity and return on investment metrics at more frequent intervals than yearly grant progress reports. This Shared Operational Support Office CITE will also be responsible for the harmonization of IP and COI policies among the universities.

The cost estimates for the Shared Operational Support Office will obviously depend on the number of universities served by each CITE. The minimum staffing requirements are one IP manager, two administrative persons, one IT database manager, one accountant and one compliance manager after one year.

6.3. CITE Board of Directors.

The CITE Board of Directors (**Figure 1**) will be representative of the universities, relevant productive sectors, investment and funding agencies and contain at least one independent member. The overall number of directors should be at least representative of all of the sectors. An Executive Committee consisting of representatives of universities, relevant productive sectors, investment and funding agencies and one independent member will oversee the operations of the CITE.

6.4. CITE Oversight Committee

The CITE Oversight Committee (**Figure 1**) is a committee at the national level that will be composed of representatives of the funding agencies, CNIC and international experts to provide recommendations and guidance regarding:

- Overall strategic direction, and
- Harmonized
    - Funding
    - Faculty evaluation, and
    - Patenting policies and metrics at the national level

7. CITE Funding and Share of Benefits

CITEs are essential to promote innovation, create new business and increase the industrial capabilities and output in key strategic sectors of the country. A successful network of CITE's will translate in greater industrial output, more jobs and tax revenues for the government. CITE's should be fully funded by the government for at least five years with some cost sharing support for IA's from the universities and research institutes. As CITE becomes successful reliance on government funding and cost sharing from universities and research institutes will decrease.

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Possible agencies to be involved through direct funding or implementation of policies in support of innovation:

- CORFO- INNOVA
- Department of Education (MECESUP)
- CONICYT-FONDEF
- Direct government support (AFD)
- Chilean Patent Office (INAPI)

The operating cost for each CITE is estimated as follows:Personnel:

Director Level:	@ US$ 120,000
Innovation Agent	@ US$ 80,000
Patent Agent	@ US$ 60,000
Support Staff:	@ US$40,000

Legal costs

Patents :	$50,000 (each issued patent)
Other:	$20,000

Outreach

Programs:	$25,000
Training:	$30,000
Travel:	$50,000
Miscellaneous:	$25,000

It is recommended that net revenues generated from licensing, equity investment and other income be shared by the stakeholders. ILB recommends the following sharing percentages:

- University/research institute: 80%. The inventor(s), department and college would split this figure as follows:
    - Inventor: 50%
    - Department: 20%
    - College: 10%
- CITE: 20%

During the first years of the program, consideration should be given to maintain the inventor's share at 50% or higher to encourage increasing participation of faculty.

8. Recommendations for Utilizing Existing Technology Transfer Capabilities

With the implementation of the CITE model for technology transfer, the inclination is to utilize existing technology transfer capabilities in Chile for perceived efficiency and economy. Leading universities in Chile have recently started to make some attempts to build technology transfer offices (TTOs) to manage their IP assets and other interface activities with the productive sector, but their skills, experience and outcomes vary widely and are not yet performing at international levels. During two fact-finding visits, ILB personnel met with four Chilean organizations whose mission is technology transfer. In general terms, two of these organizations OTRI Chile and DICTUC operated from the push side and focused on bringing technology from the universities. While FUNDACIÓN CHILE and NEOS operated from the pull or market side of the transfer equation actively seeking technology to incorporate into new business opportunities.

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OTRI Chile is a for-profit company created in 2005 by PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE (PUC), four other Chilean R&D universities and the private sector. These universities and private sector organizations include Pontificia Universidad Católica de Chile, Universidad de Concepción, Pontificia Universidad Católica de Valparaíso, Universidad Católica del Norte, Universidad Técnica Federico Santa María, Asociación de Exportadores de Chile (ASEXMA) and Confederación de la Producción y del Comercio (CPC) and comprise 43 percent of the research conducted by universities in Chile. The stated OTRI business model is transfer of research results from universities to the market through licensing of industrial property (**Figure 2**). In this model, OTRI Chile charges consultancy and licensing fees to the universities based upon services performed. Theses services include legal evaluation on patentability, prior art reports, technology transfer strategies, intellectual property policies for universities and intellectual property valuation and market analysis.

OTRI stated interactions with patent agents and consultants as well as government agencies such as CONICYT and CORFO appeared similar to the CITE schematic of **Figure 1**. During the interviews with ILB, however, OTRI representatives described a quantitative approach to assessing patentability of invention disclosures that was considered by ILB too restrictive and not sufficiency responsive to the university-based inventors as discussed below. Later discussions with other universities in the OTRI group indicated that this approach to determining patentability had basically soured universities as well as potential inventors from using OTRI and deterred innovation among faculty.

The numbers of invention disclosures filed with OTRI by stakeholders and resulting patent applications from 2006 through May 2009 supported this problematic situation. It was disclosed by OTRI that it had received 472 invention disclosures that resulted in 62 patent applications from 2006 through May 2009 from the five university and 2 industry stakeholders as well as outside inventors. These figures translate into approximately 25 disclosures per university per year and less than four patent applications per university per year. The latter figure may be inflated for the universities since it includes the industrial partners and other inventors and the fact that a single application counted multiple times due to filings in several countries (OTRI disclosed 107 foreign filings during the 2006-2009 period). Exact figures showing detailed breakdown were not forthcoming from OTRI. There was no significant licensing (four licenses in Chile during the 2006-2009 period), royalty or spinoff activity by OTRI over the period.

The mission of DICTUC, founded in 1934 as the Material Resistance Laboratory of PUC, is to manage the specialized expertise created inside PUC College of Engineering by facilitating the technology transfer process. Specialized staff has been added over the years to enhance the links between society and PUC College of Engineering. Approximately half of DICTUC activity is in consulting and half in laboratory work. Ownership of enterprises, patents, licenses and start-ups from academic research is divided with 65% for faculty member and 35% for DICTUC. The Organization reported 14 spinoffs with 205 employees were created during 2003 – 2007 and only limited activity in patent filing. Moreover, DICTUC appears to have a more fundamental level of expertise in consulting engineering and technology development rather then technology transfer as envisioned by the CITE model.

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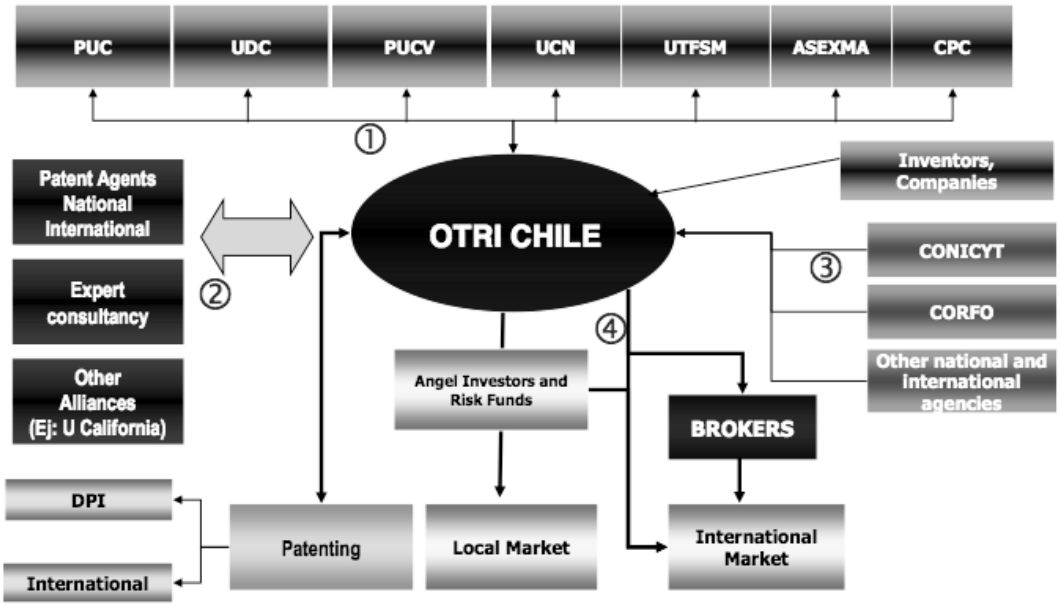

Figure 2. Schematic depiction of the interactions of OTRI Chile with stakeholders.

The mission statement of Fundacion Chile is to increase the competitivity of human resources and productive sectors and services, by promoting and developing high impact innovations, technology transfer and management for the country. Fundacion Chile's most notable success has been in the salmon farming industry and is widely credited with turning Chile (a country with no native salmon population) into the world's second largest Salmon producer. Fundacion Chile has done this through a number of business ventures. In the last 20 years Fundación Chile has established over 60 companies in innovative sectors, creating new products using the country's natural resources, generating value, quality employment and new exports (fundacionchile.cl).

NEOS is a technology transfer company that has a specific office to work with universities. They charge $2,000 for drafting a patent application and $1,500 for a patentability search. NEOS could be described as a support unit in the management of the different actors of the national technological system. Through a diversified offer and flexibility of services, constituted as a medium connecting universities, industry, and the State, NEOS focus remains on the detection and exploitation of the synergies that add value to the national technological innovation system. NEOS vision is to be the technology gateway to South America. The company describes a major issue dealing with the universities in Chile is that licensing and royalty agreements differ widely among university technology transfer departments.

In order to maximize the efficiency of introducing the new approach and to employ existing infrastructure and staff where possible ILB devoted considerable deliberation to the utilization of existing Chilean technology transfer capabilities in the CITE model. Based upon ILB team own experiences in the US and two fact-finding visits to Chile, it is recommended that the CITE model be implemented using a "best efforts" approach to patenting and licensing of university technology and the creation of new business. Best efforts imply exhausting all possible avenues

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to develop the disclosed technology into a patentable form or link it to a market application as a spinoff or license. In this scenario, it is necessary to work closely with both the faculty-inventor and production and investor sectors. This approach was evident in Chilean technology transfer companies Fundación Chile and NEOS as they worked on the pull or market side to adapt university technology to critical market needs. OTRI and DICTUC, working in the push or technology side of the transfer process, did not exemplify a best efforts approach. Rather, their analytical focus on assessing patentability or licensing potential appeared to limit technology transfer to a narrow, predictable range of applications and, to a large degree, ignore the faculty-inventor. Incorporating certain capabilities of Fundación Chile and NEOS into the CITE model would seem to provide appropriate representation on the pull side of technology transfer.

Conversely, OTRI Chile, a model with some apparent similarities to the CITE model, exhibited only limited success. Several significant reasons explain this situation. First, while OTRI is structured to provide a technology flow from the faculty-inventor to the market, the skills available within OTRI seems not to be conducive to efficient and fruitful interaction with faculty members, technology developers, productive sectors and the investment community. Failure to interact effectively with faculty by demonstrating a best efforts attempt to file patent applications and identify potential markets to faculty and their rigid and restrictive approach to establish patentability are critical flaws in the OTRI approach. Second, OTRI personnel failed to demonstrate the ability to structure reasonable business deals for beneficial partnership or the creation of a single spinoff company. Thus, the OTRI example emphasizes that personnel involved in university technology transfer are key to the success of any technology transfer program. ILB recommends an emphasis on recruiting personnel with specific experience and skills for the CITE model that may rely more on recruiting outside of these organizations and Chile for the initiation of the program.

Details on human resource requirements for the CITE model of technology transfer can be found in CHAPTER IV.

9. Estimating Optimal Number of CITE

ILB estimated the optimal number of CITES from the data on government R&D funding of 50 Chilean universities supplied by CNIC. At first ILB proposed to determine the optimal number of CITE using the statistical data analysis methodology of cluster analysis. After reviewing the statistical options, it was decided to present a graphic clustering procedure similar to the Shi-Malik algorithm, commonly used in image analysis. Partitioning of the data into clusters was performed by taking the median m of the components in v, and placing all points whose component in v was greater than m in S_1, and the rest in S_2. Hierarchical clustering for determining composition of multiple CITEs was performed by repeatedly partitioning the subsets in this fashion.

Using the data on R&D funding of 50 Chilean universities, the cumulative percent R&D funding was plotted vs increasing number of universities (**Figure 3**). Strict adherence to the Shi-Malik methodology for hierarchical clustering produces one university in CITE 1 (50% total

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R&D funding), three universities in CITE 2 (25% total R&D funding), five universities in CITE 3 (12.5% total R&D funding) and 41 universities in CITE 4 (6.3% total R&D funding). ILB believes this strict hierarchical clustering be modified to incorporate issues such as personnel availability, geography, etc. This has been done in **Figure 3** in which the criteria for CITE 2 has been shifted to the right resulting in the incorporation of six universities representing 32% of total R&D funding. CITE 3 was adjusted to represent 15% of total R&D funding resulting in an increase in university representation from five to 18. The effect of this change on CITE 4 was to decrease the university representation from 41 to 25. Optimal size of each CITE may be determined by moving the vertical arrows right or left, but it is clear from this simple graphic analysis that a high percentage of total R&D investment can be captured with three to four CITEs serving a manageable number of universities.

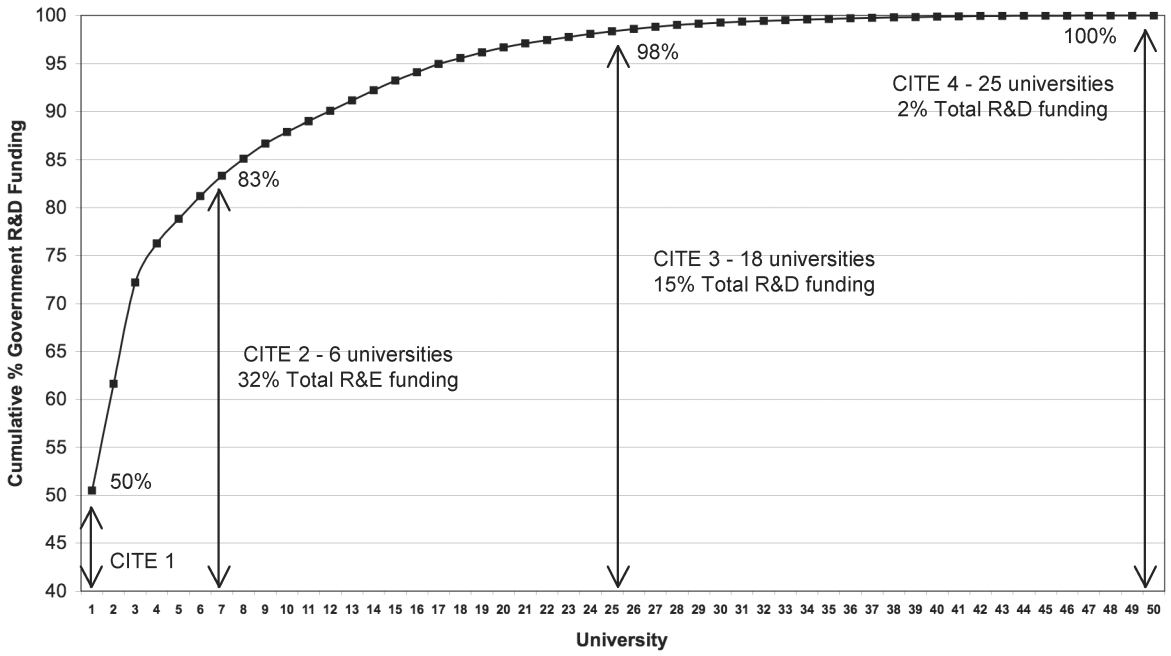

Figure 3. Graphic estimation of optimal number of CITE.

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CHAPTER IV
TECHNOLOGY TRANFER HUMAN RESOURCES REQUIREMENTS

Introduction

Based on ILB observations, at the moment Chile lacks sufficient and adequately skilled personnel to successfully manage and operate technology transfer and commercialization offices. It will be essential to have a critical mass of personnel that could join the program as quickly as possible. High priority must be given to a concerted effort to recruit (abroad if necessary) and train professional personnel in the field of technology transfer and entrepreneurial development.

1. CITE Recruitment Program

CITE will require senior managers (initially two) with a good grasp of science and technology, proven experience in intellectual property management and new business development.
CITE will require a number of Innovation Agents (initially four to six) in several disciplines with the following skills:

- Strong scientific and business background (post graduate degree) capable of recognizing opportunities at the scientific level for market applications
- Ability to interact effectively with faculty members, technology developers, productive sectors and the investment community
- Ability to structure reasonable business deals (spinoffs, licenses etc.) for beneficial partnership
- Energetic and self-driven

In addition CITE will need to be staffed with accounting, paralegal and administrative personnel that will be part of a Shared Operational Support Office (e.g. financial management, database services, IP services, outreach activities etc.).

ILB recommends recruiting at least one senior manager from established technology transfer programs in Chile (universities, private consulting business, and incubators). The second manager probably will need to be recruited outside of Chile.

2. Training Programs for CITE Personnel

It is essential for the success of the program that CITE is staffed with highly skilled Innovation Agents and other key personnel as quickly as possible. Efforts should be made to bring on board skilled personnel presently involved in Chile or abroad in technology transfer activities. Parallel to the immediate recruiting, an efficient way to bring qualified people on board will be to train a number of IA (initially five to seven) in technology transfer centers at top USA universities. The training will involve hands on experience by working in several aspects of the technology transfer process for a period of six months. ILB recommends the following Universities: Cornell University, University of California (UC Davis, San Diego, Berkeley, UCLA), Duke University, Boston University ITEC, and University of Illinois.

2.1. Position Descriptions of Key CITE Personnel

2.1.1.Executive Director, Center for Innovation and Technology Transfer

The objective is to establish a Center for Innovation and Technology Transfer office in Chile (CITE) and work closely with universities, government funding agencies, key industries,

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incubators, venture capital and entrepreneurs to promote access to intellectual property from the universities.

The director will lead a TTO in Chile that will support several local universities. The individual must be self-motivated with a proven track record in leading technology transfer activities in universities.

Qualifications: Technical and business background with a formal education in science and business (preferably MBA), and preferably experience with Technology Transfer in a university setting. Demonstrated experience working with venture capital and other financing groups, start-ups and M&A activities. International working experience and knowledge of the Spanish language would be an advantage. The candidate will need strong leadership skills and should be an experienced manager preferably familiar with directing complex multi-site operations and used to working with government and academic leaders. Must have excellent negotiating skills. Will have to be enthusiastic about working in an ambitious start-up environment and familiar with the compromises associated with maximizing resources while working with high ethical standards.

2.1.1.1 Reporting and Job Description

Reports to: The Board of Directors.
Job description: Establish a National Technology Transfer office with tight timelines and an ambitious agenda. This will include:

- High visibility leadership position at the National level
- Working with the BOD in establishing an aggressive start-up strategic operating business plan for the CITE including short, mid and long-term goals.
- Using the description for the Innovation Agent (IA - see below) as a guide, identifying, interviewing and hiring staff.
- Establishing a detailed job description for each Innovation Agent in order to address the goals established by the BOD,
- Develop a tracking method appropriate for monitoring performance towards those goals.
- To promote the CITE to the Productive Sector and to the Universities - this function will be taken over by the IA as the program matures
- Establish and maintain the highest ethical standards for the CITE
- Maintain a good working relationship with a broad group of academic and industrial leaders
- Ultimately responsible for the performance of the CITE
- May act as Board Member for selected start-ups

2.1.2. Innovation Agent

Qualifications: Strong scientific and business background (post graduate degree) capable of recognizing opportunities at the scientific level for market applications. Must possess the ability to interact effectively with faculty members, technology developers, productive sectors and the investment community. Ability to structure reasonable business deals (spinoffs, licenses etc.) for beneficial partnership.

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Technical Background and Training - understanding of complex science and technology, vision to see opportunities for cutting-edge technologies beyond established fields (nobody knows everything - ability and willingness to learn quickly and do the proper home work (do research) are paramount. The successful candidate will be an individual with a technical background such as a BS in engineering or Ph.D. in a biotechnology field.

Business Experience - understand and sympathetic to business concerns and structure, the competitive environment, fair market value and the necessary bottom-line.

Working Knowledge of Legal Issues - related to intellectual property, contract, and trade is desirable, but not essential.

Personality - pleasant, out-going and enjoys interactions, high energy and action-oriented, curious learner to work on cutting-edge researchers, thrive on non-routine work and creative thinking. An introvert, who is shy and does not enjoy interacting with others will never be a successful CITE professional.

2.1.2.1 Reporting and Job Description

Reports to: The Executive Director
Job description: Effectively identify and guide the commercialization of novel technologies from the invention stage to the start-up or licensing stage. This will involve:

- Maintaining a close relationship with a broad range of academic groups generating innovative technology
- Ability to identify the commercial potential of new ideas
- Raise the awareness of university faculty and others involved with research of the value of IP
- Increase the entrepreneurship of university faculty and others involved in research
- Promote the CITE on an ongoing basis with regular workshops and seminars at a local and National level
- Monitor the CITE progress through grass roots observations and provide feedback to the Executive Director in a timely manner

2.1.3. Patent Agent

Qualifications: Both Patent Attorneys and Patent Agents are generally required to have a technical degree (such as engineering, biology, chemistry or physics) and must take and pass the *Examination for Registration to Practice in Patent Cases Before the United States Patent and Trademark Office* before being registered to practice in the US. While passage of this examination is a requirement for registration in the US, in the CITE model this represents a level of achievement and attainment of knowledge by the PA more than entry to practice.

2.1.3.1 Reporting and Job Description

Reports to: The Executive Director and works with the Innovation Agent
Job description: Effectively identify and guide the protection of IP through the patenting process from the invention disclosure stage, filing, prosecution and allowance stage. This will involve:

- Review all disclosures with IA

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- Perform a preliminary patentability search for all disclosures
- Maintain a close relationship with faculty inventor during the disclosure process
- Inform the faculty inventor of the results of the patentability search on all disclosures
- File provisional patent applications when considered necessary
- Maintain a close relationship with contracted patent firms
- Raise the awareness of university faculty and others involved with research of identifying patentability of research results
- Promote the CITE on an ongoing basis with regular workshops and seminars at a local and National level

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CHAPTER V
POSTGRADUATE PROGRAMS LINKED TO PRODUCTIVE SECTORS

1. Assessing the Linkage Between Universities and Productive Sectors.

The University-Productive Sector relationship needs to be evaluated and enhanced, and results from changes in emphasis of this relationship measured from both perspectives. University educational programs should properly respond to the needs of Chile's productive sectors and the focus of state supported research and development needs to include these needs. This strategic focus may require resource allocation to be determined depending on the overall strategy including a re-evaluation of the role of each university in teaching and research, which should remain at an internationally acceptable level. There has been an apparently increasing divergence between academic and commercial interests within the global university systems and there is now real concern that in certain fields traditional academic education may not address the short and long term needs of the productive sectors. It is necessary that university education programs should properly respond to the present and future labor market in Chile. More use should be made of involving the productive sectors in the formal postgraduate education system. In addition a general university innovation and entrepreneur-oriented curriculum should be developed as part of the overall effort to increase the quantity of well educated leaders for Chilean industry. **See Appendix 4 for a full chapter describing the program**.

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CHAPTER VI
HARMONIZATION OF METRICS BETWEEN CITES AND FUNDING AGENCIES

Introduction

Technology transfer is a term used to describe a formal transfer of rights to use and commercialize new discoveries and innovations resulting from scientific research to another party. The keystone of technology transfer is the protection of IP through the filing and attainment of a patent or copyright. In general, world-patenting bodies define a patentable invention as the creation of a new configuration, composition of matter, device, or process. The main criterion for awarding a patent is that the invention is novel and not obvious to those who are skilled in the same field.

Overall, the four most common ways in which an inventor will be barred from receiving a patent are:

- Making the invention known or allowing the public to use the invention; or
- Having the invention published in a fixed medium (such as in a patent, patent application, or journal article); or
- Discovering that the invention was previously invented in the U.S. by another, who has not abandoned, suppressed, or concealed the invention, or
- Discovering that the invention was described in a patent application filed by another, where the application later issues as a patent
- The first section of this chapter will outline the general process of filing and attaining a patent emphasizing the potential metrics that could be used to evaluate CITE functioning by funding agencies. Later sections describe harmonized metrics between the CITE and funding agencies for licensing, creation of spinoffs and the introduction of new products.

1. Patent Filing and Prosecution

The major steps in the patenting process include:

- Disclosing of the innovation
- Searching the prior art
- Filing a provisional application
- Filing a nonprovisional application
- Prosecuting the patent application and
- Entering the PCT (Patent Cooperation Treaty) process

A schematic of the CITE patenting process described in the following sections is presented in **Figure 4**.

1.1. Invention Disclosures

An invention disclosure is a written description of an invention that enables a non-inventor to practice the invention, and which is accompanied by an Invention Disclosure Form to be completed by the university inventor(s), signed and submitted to the respective CITE.

The Complete Specification or Invention Disclosure Form must describe the invention in full

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with all the specific features and claims for which you want to be granted a patent. The specification is the description and summary of the invention and in the claims you define actually what it is that you claim protection for. It is the "claims" that define your IP ownership in the event of an infringement. Sometimes, if applicable, drawings can be attached to the application to further illustrate the invention.

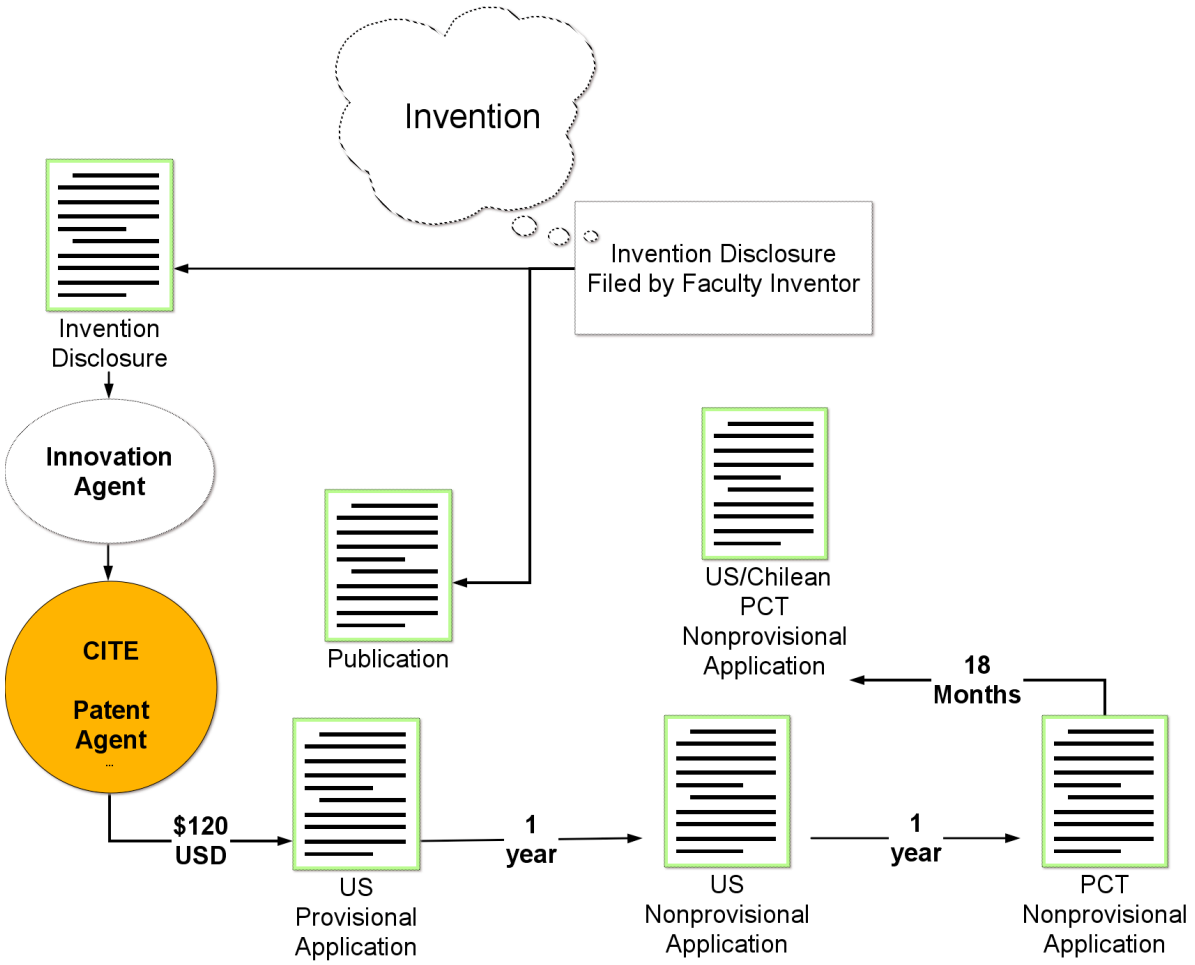

Figure 4. Timeline and schematic of the CITE patenting process indicating the interactive roles of the Innovation Agent and Patent Agent with the faculty-inventor.

All inventions made by individuals with a university appointment and/or with the use of university resources must be disclosed promptly in writing to the University Office of Intellectual Property and Technology Transfer or other agency designated by the university, using the Invention Disclosure Form. Such disclosure will include documentation to fully describe the invention's prior art, and the potential utilization. The CITE, in conjunction with the university, will then determine whether the invention is a university invention.

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1.1.1 Invention and Related Property Rights Acknowledgment Form

The Invention and Related Property Rights Acknowledgement Form must be signed by each individual receiving a university appointment to an academic position, acknowledging awareness of the University Intellectual Property Policy.

1.1.2. Office of Intellectual Property and Technology Transfer

Established and appointed by the Vice President for Research to provide advice and counsel on all matters related to intellectual property and the management of technology of the university. The university may work with a third party agency or organization such as CITE to manage and meet its Intellectual property objectives.

1.2. Searching the Prior Art

It is not necessary to conduct a patent search before filing any patent applications. To be a valid patent, however, what is claimed must be "novel" - i.e. it must not be an obvious way of solving a problem, and must incorporate some inventive step. Therefore, if another has thought of the idea before and patented it, or even put it into use, or described it in a publication, it will not be considered "novel." In patenting terms, information in the public domain is what is referred to as part of the prior art.

It is the responsibility of the PA to complete a preliminary prior art search with the faculty-inventor. A brief search for prior art by the PA can include:

- Trade and technical publications
- Files at Patent Offices
- Computer databases at Patent Offices
    - The Intellectual Property Digital Library - http://www.wipo.int/ipdl/en/
    - The US PTO database – http://www.uspto.gov/
    - The Google Patent Search for US patents - http://www.google.com/patents

Doing a patent search can also show how similar applications are structured, and allow the PA to structure the application and claims to avoid rejection on the basis of obviousness or to instruct the faculty-inventor on future experiments to overcome obstacles in the public domain. Since the faculty-inventors are deeply involved in their particular fields, they will know the field well and are a good source to determine whether there is any prior art that may anticipate the finding being patented.

1.3. Filing a Provisional Patent Application

There are two ways that you can file a patent application. The provisional application is optional and buys you time before you have to file the complete or final application, which is the one you have to do before a patent will be granted.

The advantages of a provisional application are:

- Cheaper and faster
- The inventor or assignee can include changes made to the invention in the complete application; however, there are limits to this. On the other hand, changes are difficult to do after the complete application has been filed.

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- The inventor or assignee has protection (normally for a year – see **Figure 4**) during which the inventor or assignee can do market research and patent searches, to help decide on how to proceed to patent the invention.

The primary reason for considering the filing of a provisional application by the PA is the speed at which the application can be prepared and filed. This may be vital to the protection of the IP in cases where it is necessary for the faculty-inventor to publicly disclose some aspect of the invention in a presentation or publication. The PA can file a US provisional patent application within one to two days of receiving a disclosure form using the information provided on the disclosure form (**Appendix 2**) and the patent application blank in **Appendix 5**. Critical information to be filed with the US provisional patent is abstracted in **Figure 5**.

INVENTION DISCLOSURE FORM INFORMATION NECESSARY FOR FILING A US PROVISIONAL PATENT APPLICATION

I. Title of Invention

_____

_____

II. Brief Description of Invention*

_____

_____

_____

_____

_____

_____

_____

_____

*For a complete description please include an Attachment with the following:

1. Background of the Invention and Related Technologies (the problem the invention solves)
2. Are there existing products that address the same problem that the Invention solves? Please name and describe them.
3. List all relevant publications, patents and competing inventors or labs that you are aware of.
4. Unique Features of the Invention
5. List all of the features that distinguish the Invention over the Related Technologies.
6. Detailed Description of the Invention including:
7. How to make and use the Invention

b. Best mode of making the Invention

c. Drawings or pictures of all aspects of the Invention

4. Possible alternative versions of the Invention

5. Probable uses of the Invention

Figure 5. Section of Invention Disclosure Form used for rapidly filing a provisional patent application by the Patent Agent.

Once filed, the US provisional patent provides a one-year period of protection against unintentional disclosure of information that would cause a rejection of the final, nonprovisional application (see **Figure 4**). During this time, additional experiments may be conducted to strengthen support of the claims or circumventing known prior art.

1.4. Filing a Nonprovisional Patent Application

The key elements of a nonprovisional patent application are:

- The Specification
  - Title
  - Background of the Invention
    - Field of the Invention
    - Description of the Related Art
  - Summary of the Invention
  - Brief Description of the Drawings

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  - Detailed Description of the Invention
  - Examples
- Claims
- Abstract and
- Drawings.

The patent application blank in **Appendix 5** contains all of the above elements formatted to conform to the USPTO requirements. The specification, with the help of the drawings, explains how to make and use the invention. The claims define the scope or boundaries of the patent. The application must also include an abstract that summarizes the invention.

Although a provisional patent can be assembled by the PA from the information provided in the Invention Disclosure form and without claims, the nonprovisional patent application should be filed by a patent firm in the country in which the application is to be filed (see Section 1.5).

1.5. Prosecuting the Patent Application

Patent prosecution is the process of "negotiating" or "arguing" with a patent office for the grant of a patent, and interaction with a patent office with regard to a patent after its grant. This process often takes several years and should be contracted with patent firms in the country in which the patent is being prosecuted.

During this process, the Patent Office may ask for further supportive documentation or simply reject the application due to:

- Insufficient specifications and claims
- The invention is not novel
- The invention is obvious

While the contracted patent attorneys do the major work of prosecution, it is essential to maintain the relationship of the PA and faculty-inventor with the outside agents to assure a successful outcome. Frequently it is only the faculty-inventor who can argue the subtle points of the rejected claims. Having the PA working with the faculty inventor allows for the highest probability of obtaining a patent allowance with the broadest claims.

1.6. Entering the PCT

The PCT offers an alternative route to filing patent applications directly in the patent offices of those countries that are Contracting States of the PCT. The process also affords an extension of the time to file the PCT application by 24 months (see **Figure 4**).

The PCT enables an applicant to file one application, "an international application," in a standardized format in the appropriate receiving office, and have that application acknowledged as a regular national or regional filing in as many Contracting States to the PCT as the applicant "designates" or "elects," that is, names, as countries or regions in which patent protection is desired (http://www.uspto.gov/web/offices/pac/mpep/documents/1800_1801.htm).

In the same manner, the PCT enables foreign applicants to file a PCT international application, designating the United States of America, in their home language in their home patent office and have the application acknowledged as a regular U.S. national filing. The PCT also provides for

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an international search report and written opinion (for international applications filed on or after January 1, 2004) that are established normally at 16 months from the priority date, and publication of the international application after 18 months from the priority date. Upon payment of national fees and the furnishing of any required translation, usually 30 months after the filing of any priority application for the invention, or the international filing date if no priority is claimed, the application will be subjected to national procedures for granting of patents in each of the designated countries.

Chile became the 140 contracting state of the Patent Cooperation Treaty (PCT) when it deposited its instrument of accession at WIPO on March 2, 2009. The Treaty will enter into force for Chile on June 2, 2009. The accession by Chile means that in any international application filed on or after June 2, 2009, Chile will automatically be designated, and as it will be bound by Chapter II of the Treaty, will automatically be elected in any demand for international preliminary examination filed in respect of an international application filed on or after June 2, 2009. Also, as of that date, nationals and residents of Chile will themselves be able to file PCT applications. With the accession of Chile, the 140 contracting states of the PCT are presented in **Appendix 6.**

2. Licensing

2.1. Licensing University Inventions

CITE may negotiate a license to a university invention and related property rights to promote the likelihood that the university invention will provide a benefit to the public and the university. The license will generally cover nonrefundable license fees, patent expense reimbursement, royalty and minimum royalty payments. If the licensee does not take effective steps within a reasonable time to achieve practical application of the university invention, the university maintains the right to grant a license to another licensee upon terms reasonable under the circumstances.

2.2. Procedures

2.2.1. Signing the Acknowledgement Form

Each individual receiving a university appointment to an academic position, including clinical and affiliation appointments and those with modified titles (visiting, adjunct, courtesy, etc.), graduate students appointed on research assistantships, graduate research assistantships, fellowships, and training grants, and certain nonacademic positions as may be designated by the Vice President of Research, must execute the “Invention and Related Property Rights Acknowledgement” form, acknowledging awareness of the terms of this policy. Initiation of the university appointment requires completion and submission of this form.

2.2.2. Disclosing Inventions

All inventions made by individuals with a University appointment and/or with the use of University resources must be disclosed promptly in writing to CITE, using the Invention Disclosure Form. Such disclosure will include documentation to fully describe the invention's

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prior art, and the potential utilization. CITE in conjunction with the University will then determine whether the invention is a University invention.

2.2.3. Evaluating and Protecting Inventions

CITE in conjunction with the university will evaluate all disclosed inventions for their commercialization potential and determine the appropriate means for protecting and promoting the development of the invention. Inventors will cooperate with the university or its designee in the university's effort to evaluate and protect university inventions.

When a patent application has been authorized by the Vice President of Research on a disclosed invention, CITE will work with the inventors to prepare a patent application. Inventors are required to provide a reasonable level of assistance in this process. Patent applications are filed in the name of the university. CITE will be responsible for responding to any requests for further information from a foreign patent office or Instituto Nacional de Propiedad Industrial (INAPI).

2.2.4. Distributing License Revenue

In the case of a university invention, the university will receive all license revenue and distribute total net license revenue as follows:

- 80 percent to be divided as follows:
  - 50 percent to the university inventor(s) in recognition of the inventor contribution. In the case of university co-inventors, this distribution will be shared, and 25 percent to the inventor's research budget, subunit (typically the inventor's department, school, section, or center) and
  - 20 percent to the university unit (typically the inventor's college) in a manner to be determined by the dean of the unit (or, for research centers in the Vice President of Research)
- 10 percent to the university to provide CITE with operating funds to cover the cost of service provided to the university with regard to intellectual property matters and particularly to cover direct costs, where license revenue or other cost recovery has not been achieved.

In the case of an irresolvable dispute over net license revenue distributions, such revenue, except the 20 percent to be distributed to CITE will be distributed as determined by the Vice President of Research, whose decision will be final.

2.2.5. Distributing Equity Revenue

Proceeds from the liquidation of equity received by the University will be distributed as license revenue in the manner described in "Distributing License Revenues," above.

3. Creation of Spinoffs

(Reproduced in part from from ACADEMIC SPIN-OFF COMPANIES: MYTHS AND PITFALLS http://www2.warwick.ac.uk/services/ventures/myths-and-pitfalls.pdf)

In many universities, the Technology Transfer Office is mainly occupied with licensing. Spin

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offs are treated with suspicion, as too complicated compared to a nice quick license. In addition, spinoffs can produce conflicts of interest, where the academic is also a company shareholder and board member. Moreover, it seems safer for the university to keep its hands off, and just sign a simple license and collect the royalties.

The main problem with this attitude is that most university research doesn't usually result in a nice neat invention, ready for a nice neat license. University research usually produces something that works sometimes in the laboratory but significant development is necessary before it could be released onto the market. Unfortunately, most companies don't want to undertake this development work. It seems too risky, and too expensive. And, of course, the fact that they will have to do all the development work means that they are unwilling to pay much to the university. The Association of University Technology Managers (AUTM) survey of US universities showed that the average advance payment on their licenses was $35, 000 USD. The fact that $2.1 million of research is required for each invention, to part with the best ones for only $55,000 is not an impressive return on investment.

So, in many cases a spin-off company is a necessary step to develop the product, and demonstrate its market, to take some of the early-stage risk out. In the particular case of Chile, ILB sees the spinoff option as critical for economic development particularly in the clusters defined by the country innovation policy. This will allow the creation of value added in these areas, new jobs and to be able to better compete in the global economy. The new spinoff company can raise the initial funds through CITE's Venture Capital Vehicle previously described in conjunction with small business grants and other venture funding Once the product is fully developed, and customers are clearly keen on getting it, larger companies will suddenly become very interested, and will start to offer much larger sums of money for exclusive rights. And, of course, the company still has the option of turning down these offers, and selling the goods or services themselves, building up the value of the company so it may eventually be worth millions to the shareholders.

If the university academic department offers free space to the spin-off company, it is usually intending to be kind, but it is actually being cruel for the following reasons:

- Free space is a bad discipline. If the company grows it will need to rent space at a later date, so it should get used to the idea that it has to pay this overhead, and build it into its cost and pricing structure.
- The company staff needs to know that they are different from the academics. They should be different in salary, motivation, hours of work and many other cultural ways. To mix the two together in adjacent offices will produce tensions and harm both.

The basic position for universities is that new companies are not offered space within the department, but directed to the Science Park and business incubators nearby.

In summary, when dealing with spinoffs the university should:

- Control the intellectual property
- Concentrate its efforts through CITE on company formation, not company management
- Provide management support to the academics in the first year or so, but then phase out

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university involvement
- Encourage new companies to stand on their own feet, financially
- Look for outside investment funds early
- Expect little financial benefit in the first few years, but after five years, the benefits can be very large.

4. Introduction of new products

The introduction of new products from a university requires the interaction of several factors that can be described by a case study of one product from the Department of Food Science at Cornell University. First, associate Professor Dr. Rui Hai Liu provided the background research demonstrating that apple peel was more nutrient-rich than the flesh of an apple, and that dried and powdered apple peel further concentrates nutrients found in the skin, and made them more bioavailable. Second, Cornell University filed a patent on the process (Patent Ap. # 11/018,833) for making dried apple peel powder (DAPP), which plays the pivotal role in freeing the apple peels' bioactivity. Third, the pilot plant in the Department of Food Science produced a novel energy snack tube termed AppleBoost™ for marketing to athletes and sports enthusiasts. Thus, a waste product of the applesauce industry was transformed into a nutritious, functional food with market value.

This story has been frequently repeated at Cornell. The Food Venture Center of the New York State Agricultural Experiment Station converted tons of butternut squash waste into cold-pressed, nutty-flavored butternut squash seed oil. This squash-seed oil has uses in salads, dressings and marinades.

The pattern in these examples of university product development is similar and follows several general rules:
- A dedicated faculty member or research team
- Public funding of food product ventures
- Strong relationship or interaction with a committed stakeholder group
- A technology transfer group supporting product development, and
- Pilot plant facilities for formulating potential commercial products

All but pilot plant facilities are described in the CITE model. To successfully add pilot plant facilities, the public funding agency would need to define policies for the maintenance and open use of large-scale equipment and pilot plants, and the parties to the consortia would need to commit to such policies.

5. Summary of Metrics

Early numerical measures of academic technology transfer include:
- Number of invention disclosures
- Number of patents filed

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- Number of license agreements executed
- Number of spinoff companies formed

Later numerical measures that can be applied include:

- Revenues from license fees
- Royalties and cash from equity investments paid to the institution
- Numbers of products successfully introduced into the market

Non-numerical benefits to the university:

- Ability to retain entrepreneurial faculty
- Attract outstanding graduate students
- Increase reputation for innovation
- Augment its research program through the interaction with the private sector
- Enhance its reputation for providing highly trained students for the industrial work force.

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CHAPTER VII
HARMONIZATION OF FUNDING AGENCIES FINANCIAL MECHANISMS AND CITE OBJECTIVES

Listed below are the CITE activities that will require funding mechanism from different agencies to support its implementation. The financial mechanisms should be made available to each CITE based on reaching certain pre-agreed milestones.

1. **Patenting and Licensing**
   Support for legal fees, applications costs and patent prosecution in different countries.

2. **Marketing**
   Establish financial instruments to provide funds for marketing and outreach activities. This can be combined with linkage to incubators

3. **Training**
   Establish agreements with different US universities for the training of IA's, including living expenses.
   Establish program for the training of PA's in the US including living expenses

4. **Shared Operational Support**
   Mechanism to finance back office through contract with third party of through the establishment of independent internal capabilities including training of personnel

5. **Seed Capital (spinoffs)**
   Establish mechanisms to finance the creation of a Venture Company and the creation of an investment fund of up to $2million to be available during a five year period

6. **Share Funding with Industry Partner (proof of concept & product development)**
   Establish financial mechanisms for industry to have funds available for early stage product development

7. **Linkage with Incubators**
   Funding mechanisms in support of incubators directly linked with CITE's spinoffs or proof of concept

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CHAPTER VIII
FINANCIAL STRUCTURE

1 Financing Renewal Timelines

CITE's are critical to promote innovation, create new business, transfer technology into the productive sectors to increase the industrial capabilities and output in key strategic sectors of the country. A successful network of CITE's will translate in greater industrial output, increase demand for a specialized labor force and a larger tax revenue basis for the government. CITE's should be fully funded by the government for at least 5 years with some cost sharing support for IA's from the universities and research institutes. It is recommended that Universities contribute to a 5-10% of the cost of IA's working in CITES where the University is a member.

As CITE's becomes successful, reliance on government funding should gradually decrease. It is recommended that 20% of revenues generated from licensing and spinoff activities is retained by CITE.

Continued financial support of CITES from government funding agencies will be subjected to achieve certain milestones during the first five-year period.

2. CITE Milestones

2.2. Short Term Milestones (to one year)

1. Recruit at least one Executive Director and two Innovation Agents (six months)
2. Arrange training in the US for at least five Innovation Agents (six months)
3. Recruit and train at least two Patent Agents (eight months)
4. Establishment of a database system (network) for all present and future invention disclosures, patent applications, licensing etc. (12 months)
5. Set up system to follow up on all existing invention disclosures, patent prosecution and licensing activities (12 months)
6. Establishment of a web site with searching capabilities regarding IP activities of all CITES (12 months)
7. Set up financial, legal and administrative support system linked to all CITES (eight months)
8. Organize at least three Technology Fairs with participation of universities, industry, incubators, private funding (Angels, VC etc) (12 months)
9. Organize workshops to introduce CITE's capabilities' and discuss IP and COI policies (six months)
10. Established appropriate linkages with international Technology Transfer Offices or other organizations such as AUTM and others (12 months)
11. Establish contact with at least 50% of universities PI's conducting research and prepare a list of possible invention disclosures to follow up (10 months)
12. Complete list of possible invention disclosures from all PI's (12 months)
13. Identify potential licensees for patents issued and filed (12 months)
14. Organize inventors contest

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2.2. CITE Medium Term Milestones (to three years)

1. Complete establishment of CITES
2. Complete recruiting of Directors, Innovation Agents and Patent Agents (18 months)
3. Complete training of Innovation Agents in the US (24 months)
4. Provide quarterly reports of IP activity (invention disclosures, patent applications, prosecution, licensing, spinoff etc)
5. Secure filing of 50 patents in Chile and international (24 months)
6. Initiate discussions for up to 15 licensing and/or creation of 3 spinoffs (18 months)
7. Complete at least 10 licenses and the creation of at least 2 spinoff (24 months)
8. Organize at least 4 Technology Fairs with participation of universities, industry, incubators, private funding (Angels, VC etc) (24 months)
9. Organize 8 workshops on entrepreneurial support to faculty (36 months)
10. Organize 2 inventors contests (18 months)

2.3. CITE Long Term Milestones (to five years)

1. Secure necessary funding for CITE for 36 months
2. Complete 25 licenses in Chile and international (48 months)
3. Secure filing of 350 patents in Chile and international (60 months)
4. Create 8 spinoff companies with secured funding for at least 2 years (60 months)
5. Organize 12 Technology Fairs with participation of Angels, VC and industry (60 months)
6. Organize 13 workshops on entrepreneurial support to faculty (60 months)

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CHAPTER IX
REQUIREMENTS FOR THE INITIATION OF THE PROGRAM

Assuming that funding has been secured and that there are enough universities interested in participating, the following actions are required for launching a successful CITE program:

1. **Identify a consultant group to assist in the launching of the program (one month)**

2. **Establish Oversight Committee (one month) and hire a senior and experienced person to lead the launching of the program**

3. **Work with interested Universities through the process of application to join CITE and harmonization of their IP and COI policies**

4. **Establish training program for IA and PA with at least two universities in the US (three months)**

5. **Identify and hire at least one CITE Director and two IA plus support personnel (five months)**

6. **Establish CITE Support Office (six months)**

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CHAPTER X
RECOMENDATIONS

1. Intellectual property and conflict of interest policies

- Intellectual property generated from state funded research conducted at universities, research institutes and other organizations is owned by them. It must be a clear policy, which addresses this throughout the Chile research system.

- Ownership of Inventions: As the first step in this process each university or research institute employee engaged in research should be required to enter a written agreement agreeing to comply with the IP regulations. These regulations should be clear that the results form the faculties or scientists research are the property of the university or research institute, and that the faculty or scientist must work with the university or research institute to protect it and use it for the good of the society where ever possible.

- Faculty members and researchers should be required to obtain written permission from their department head and from the CITE director before submitting any research manuscript for publication.

- A process involving full disclosure of all intellectual property generated by the faculty or researchers working within the university or research institutes and using a standard invention disclosure form should be employed. These invention disclosures will form the body of information from which patent applications and start up companies will arise.

- Evaluating and Protecting the Invention will involve the inventor and the CITE staff.

- Licensing University Inventions should involve both the inventor and the CITE staff who will work together to identify potential licensee; however the CITE staff will lead the license negotiations.

- Revenues should be shared among the inventors, the university and the CITE, with the inventor receiving the major portion of any revenues – we propose that this be 50% of the total revenues at the start of the program with the flexibility for this to be changed as the program matures.

- A system within the university and research institutes that rewards patenting equally with publishing should be adopted.

- Template for Harmonized Conflict of Interest Policy: A standardized conflict of interest policy must be produced by the universities and research institutes and approved by the CITE Oversight Committee. All faculty members and scientists working in research institutes will execute this conflict of interest agreement.

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- The conflict of interest policy should be implemented in Universities as well as research institutes and it should cover categories of conflicts, deans, directors, faculty, staff and institutional responsibilities, potential conflict disclosure and avoidance of conflicts, the resolution of conflicts Involving faculty and staff and university oversight on conflicts of interest.

2. Centers for Innovation and Technology Transfer (CITE)

- ILB recommends as a model the establishment of centers which will be responsible for intellectual property management including technology transfer and marketing intellectual property from Chilean universities and research institutes; these could be known as Centers for Innovation, Technology Transfer and Entrepreneurship (CITE)

- The function of the CITE is the capture and management of all intellectual property generated through State-funded research activity. The capture of this IP will involve the active participation of the CITE staff who will work closely with faculty to help identify valuable IP. CITE mission and role is exclusively as an agent of technology transfer and it will not be involved in securing research funds and writing grant proposals on behalf of universities.

- It is anticipated that there will be up to four such Centers within Chile each supporting a group of research workers at universities and research institutes.

- Each CITE should represent a consortium of research universities and institutes with total annual research support representing 80 to 95% of R& funding.

- CITE Stakeholders should include the universities and research institutes. The relevant government agencies, productive sectors and the investment community will have representation in the CITE board of directors.

- Institutions other than research universities or research institutes (such as FDF and Intesal) could work with CITE to access appropriate technology.

- Each CITE should be staffed by specialized personnel including an Executive Director, innovation agents (IA) and patent agents (PA).

- The CITE will have multiple levels of management and oversight; each CITE will have an Executive Director who will report to the CITE Board of Directors; the CITE system will have an Oversight Committee with members including national and international experts.

- The IP management function will involve multiple levels of input from all interested parties including the universities, productive sectors and investment groups.

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- The management of the CITE will be identified though a competitive process and using guidelines established by the Board of Directors

- The Recruitment Committee will report to the Board of Directors; however the Oversight Committee should be responsible for advising and approving potential candidates for the director, IA and PA positions. Oversight Committee comments will be part of the CITE records.

- A shared back office for the CITEs should be established. The exact roles can be fine tuned by the Board and the office role can be outsourced to an organization with the required expertise in the field.

- Funding for the CITE should initially be from state agencies with the expectation that this support may decrease as the CITEs become established and start to generate fees themselves.

- A single Venture Firm with professional management and at least two million dollars available for investment should be established for the sole purpose of creating start up companies using all CITE's derived technology.

- The venture investment will be a seed round of approximately two hundred and fifty thousand dollars to help the start up company organize itself to the point where an A-round of investment should be possible. The Venture Firm will have the flexibility to work in syndicates involving other venture firms including those from foreign investors

- Recommendations for utilizing existing technology transfer capabilities are addressed in details within the Report and as a recommendation below.

3. Technology Transfer and human resources requirements

- The CITE Recruitment Program should include recruitment and training expectations. The Executive Director should have a mix of business leadership and technical skills, the Innovation Agent will be expected to embed themselves into the research faculty to identify opportunities, and the Patent Agent work with the faculty and act as go between to the patent attorney.

- ILB recommends a Recruitment Committee that must have an independent and international oversight panel responsible for advising and approving director, IA and PA candidate selection. Advisory panel comments will be part of the records.

- ILB recommends that all IA's receive training in one of the following Universities: Cornell University, University of California (UC Davis, San Diego, Berkeley, UCLA), Duke University, Boston University ITEC, and University of Illinois – each of these universities have agreed in principle to work on this project. The training should involve

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the IA to work in a TTO for a period of 4-6 months in close interaction with the TTO management to be exposed to different aspects of the operation.

- ILB recommends that the Patent Agent may be exposed to the training, which would enable them to pass the *Examination for Registration to Practice in Patent Cases Before the United States Patent and Trademark Office* in the US. The Patent Agent could also be involved in training at a TTO for a short period of time.

- ILB recommend that individuals presently working in technology transfer activities in Chilean universities and other organizations be considered as potential candidates to fill CITE positions. ILB had the opportunity to interact with several individuals in this category and could provide feedback in a confidential manner.

4. Harmonization of metrics between CITEs and funding agencies

- ILB recommends that an aggressive program of patent filing be undertaken; this activity can be monitored by tracking invention disclosures, both provisional and non-provisional patent filings, and patents issued.

- Creating spin offs should be encouraged whenever possible and is the preferred mechanism for realizing greater benefits for Chile.

- Licensing university inventions should be encouraged, especially to Chilean enterprises although given the choice using novel technology for start up companies wherever possible is preferred as this has a greater economic impact.

- CITEs through their backup support office should maintain detailed records of these activities that can be compared to those available from past efforts in order to monitor progress.

5. Harmonization of funding agencies, financial mechanisms and CITE objectives

- Patenting and licensing
- Marketing
- Training
- Shared Operational Support
- Seed Capital (spinoffs)
- Share Funding with Industry Partner (proof of concept & product development)
- Linkage with Incubators

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6. Financial Structure

- CITEs should be fully funded by the government for a period do of at least five years from inception although the support of the IAs and PAs be shared with the universities and research institutions.
- It is recommended that twenty percent of revenues generated from licensing and spinoff activities be retained by the CITE to help defray costs.
- Milestones for one year, three years and five years should be established by the Board of Directors; ILB has suggested a structure for this in the Report which includes in the first year objectives which are centered on setting up the organization and training staff, and for the three years and five year goals to include some of the less predictable indicators which should be accomplished over time.

7. Requirements for the initiation of the program

- The following objectives are recommended to initiate the program:
  - Identification of outside consultants for the initiation of the program
  - Establish Oversight Committee and hire a senior and experienced person to lead the launching of the program
  - Work with interested Universities through the process of joining CITE and harmonization of their IP and COI policies
  - Establish training program for IA and PA with at least two universities in the US
  - Identify and hire at least one CITE Director and two IA plus support personnel
  - Establish CITE Support Office

8. Postgraduate programs linked to the Productive Sectors

- There are three major roles for the university system: education, research and service to the society; ILB recommends that this last link may be strengthened to maximize the current opportunity to benefit society by promoting graduate level education of innovative entrepreneurs.

- Key elements include the universities including faculty and students, the productive sectors and the government agencies and the interaction of these groups should be promoted through shared interests and common goals.

- The productive sectors have specific requirements for employees and the universities and productive sectors should work closely in developing graduate education programs which address these needs.

- The universities and productive sectors should examine the professional graduate programs such as those being developed in the US which specifically aim at producing graduates educated in both academic and business skills.

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- A graduate program that involves a large part of the students time devoted to internships should be considered.

- A graduate program in innovation and entrepreneurships should also be evaluated as a route to increasing entrepreneurial activity within the high tech and related fields

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Appendix 1
Examples of Potential Conflicts of Interest

1. Participation in Business Negotiations. No university employee having a significant financial interest in an organization outside the university may participate in negotiating the terms of an agreement between the university and that organization.

2. Participation in Administration of Agreements. No university employee having a significant financial interest or a management position in a commercial or non-profit organization outside the university may have primary responsibility for administering an agreement between the university and that organization.

3. Availability of Research Data. All data and results arising from research in which an Investigator has a significant financial interest required to be disclosed under this policy must be available for disinterested scientific review.

4. Clinical Trial Investigators. No one may participate as an investigator in a clinical trial sponsored by a commercial or non-profit organization in which he or she has an equity or intellectual property interest, holds a management position or serves on the organization's Board of Directors.

5. Outside Consulting Work. Investigators receiving compensation from a commercial or nonprofit organization outside the university must ensure that no services performed as part of outside consulting work duplicate any work they perform while participating in research. Prior approval of all outside consulting is required.

6. Performance of University Obligations. Investigators receiving compensation from a commercial or non-profit organization outside the university must ensure that no services performed as part of outside consulting work are inconsistent with their university obligations.

7. Informed Consent. No investigator having a significant financial interest may participate in the informed consent process in research involving human subjects.

8. Disclosure of Interests. All investigators having a Significant Financial Interest must disclose the nature of the interest in connection with scholarly publication or presentation of the results of the research.

9. Financial Interests in Competitors and Competitive Products. Investigators shall be considered as having a financial interest for the purposes of this policy if they have any interest of economic or money value in a business that produces a competing product that could reasonably appear to affect or to be affected by the particular research or technology transfer transaction under consideration.

10. Clinical Trials of University Technology. No person shall participate in a Clinical Trial involving technologies licensed by the university if that person has a substantial equity interest in

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the licensee or intellectual property interest in the technology. When the university has either a substantial equity interest in the licensee or an intellectual property interest in the technology, funding for clinical trials will not be accepted without a full conflict of interest review and management plan being implemented.

11. Data Production and Analysis. Investigators having a Significant Financial Interest shall not perform primary data analysis or production of data involving subjective scoring or similar methods of obtain data unless there is a clear and convincing indication that the design of the research and its analysis would provide no opportunity for bias.

12. Protection of Students. Particular attention shall be given to protecting students who could be adversely affected by the Significant Financial Interest of an investigator or other university employee who has academic responsibility for the student.

13. Oversight Arrangements. In general, oversight committees or other oversight arrangements will be established in cases involving intellectual property interests, equity interests in start-up companies, student researchers, and potential conflicts of interest.

14. Conflicting Management Roles in Outside Organizations. No person may simultaneously serve in key management positions for both the university and an outside organization on the same research project. For purposes of this guideline, key management positions shall include principal investigator and any other role in which the person has the authority to make or recommend significant business, contractual, or financial decisions relating to the research project. In no event may an investigator act as Principal Investigator for both the university and an organization contracting with the university with respect to a research project unless another university employee, not in a direct reporting relationship to the conflicted University Investigator, has been designated by the university to be responsible for all business, contractual, and financial decisions relating to the outside organization.

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Appendix 2
Disclosure Form

Name: _____

Title: _____

Department/College: _____

CONFIDENTIAL
Annual Disclosure Statement of External Interests and Time Commitments

Part I
The university is a learning community that seeks to serve society by educating the leaders of tomorrow and extending the frontiers of knowledge. Supporting that mission, the goal of research at the university is to excel in the production of new knowledge, in the training of the next generation of scholars, and in the transfer of results to society for use. The university encourages academic personnel, consistent with university policy, to engage in sponsored research, to participate in professional practice as appropriate and necessary to sustaining intellectual output, to consult widely, and to engage in entrepreneurial and other activities that may benefit not only the participants but also the university and the larger public. The academic community at the university strives toward these objectives in a context of freedom with responsibility. The university's conflicts policy recognizes and affirms the settled tradition and expectation that members will conduct their relationships with each other and the university with candor and integrity. Recognizing the increasing complexity of external relationships, the university asks individuals to be mindful of situations where there is a potential conflict of interest or commitment.

The university does not require individuals to avoid all situations where there may be a seeming or potential conflict of interest. On the contrary, some types of conflicts are unavoidable and completely acceptable. When they arise, disclosure is often the only action required of the individual. The primary purpose of these annual disclosures is to form the basis of a discussion between academic personnel and their department chairs/unit heads about potential conflicts in order to recognize and to resolve potential conflicts. The obligation to disclose external financial interests and time commitments stems from the public trust vested in a university, is required by the University Conflicts Policy, and fulfills legal reporting requirements to funding agencies. The university's process for annual disclosure balances these needs while avoiding unreasonable intrusion into the external interests and activities of university employees.

The University Oversight Committee on Conflicts (UOC) oversees the annual disclosure process, through the Office of the Vice President of Research. Responsibility for collection, review, and reporting on conflicts disclosure statements rests with the Deans and Department Chairs/Unit Heads. Disclosures are considered sensitive, confidential documents. Completed disclosures (including Part II, if applicable) will be seen by the corresponding department chair, college dean

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and their COI representatives. The UOC will have access to anonymous data; respondent's names will not be associated with the data provided.
Definitions of selected terms are supplied on the attached information sheet.

A. If you give occasional lectures, seminars, or participate in panels at universities and other nonprofit organizations for which you receive compensation (other than for expenses), please indicate:
Total number of days effort, Jan. 1 - Dec. 31, 200_:_____
(If you were paid or self-employed by the hour for a specific task, divide the number of hours paid or devoted to the task by 8 to obtain the number of days.)

B. The university asks that faculty and staff make more detailed disclosure of any of the following activities that apply to them.
1. Any outside sources of compensation (other than the activities reported in Question A, and excluding income from publications or other scholarly works).
2. Any external managerial responsibilities (including self-employment).
3. An equity interest in any business related to your professional activities at the university, held by you or your family, whose value may have been influenced by the exercise of your professional duties at the university.
4. A policy position held and/or receipt of more than $500, by you or any member of your family, from any for-profit business (excluding your consulting income) whose activities relate to your professional activities at the university.
5. Use or employment for activities external to the university (in either paid or unpaid capacity), by you or any member of your family, of the services of the university students or staff over whom you exercise supervisory or academic responsibility in your role at the university.
6. Use of the university facilities, equipment, or staff services to support consulting at a for-profit business or some other commercial activity.
7. A financial interest, by you or any member of your family, in any contract, sale, or other transaction that you are aware of to which the university was a party and whose outcome you had any perceived ability to influence.
8. Any other situations, not listed above, that you might reasonably foresee as creating an actual or perceived conflict of interest or conflict of commitment between your role at the university and an outside interest.

If any of your outside activities or interests fit the situations described above in Question B, you must complete Part II. The university policy requires you to disclose those activities and to discuss all such future activities with your Department Chair before committing to them. (In answering these questions, it is understood that you are responding for yourself, your spouse or children, siblings, parents, dependents, or members of your household.)

Please check one of the following statements and sign this form.

_____ 1. I have had no activities during the immediately previous calendar year that fit into the classifications described above to disclose, other than those described in

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Question A. I certify that the information on this disclosure statement is true to the best of my knowledge. I supply this information for confidential review by the University and I do not authorize its release for any other use. I agree to disclose future activity to my Department Chair before committing to it.

_____ 2. I have activities or have committed to future activities that fit into the classifications described in Question B to disclose. I will fill out Part II of the disclosure form. I certify that the information on this disclosure statement is true to the best of my knowledge. I supply this information for confidential review by the University and I do not authorize its release for any other use. I agree to disclose future activity to my Department Chair before committing to it.

Signature:_____

Date:_____

Please submit paper copies to your Department Chair /Unit Director.

Definitions
Activities: The activities of a business ***include*** both direct activities of that business and the activities of any entities which that business controls.
Business: Any corporation, partnership, proprietorship, firm, franchise, association, holding company, joint stock company, receivership, trust, or any other legal entity organized for profit. It ***does not include*** mutual funds over which you have no control, or any governmental committee, community, political, academic, charitable, religious, social, or professional nonprofit organization.
Contracts: Excludes the terms of your own or any family member's employment contract with the University.
The University: Includes all units operated by the University.
Equity interest: Ownership or control of stock, stock options, or other investment instruments.
Facilities: Excludes your office, office equipment and incidental supplies (e.g. personal computers and local telephone service), libraries, and commonly available services (e.g. copying, FAX, long-distance telephone service) for which you reimburse the University.
Family: Spouse, children, siblings, parents, dependents, or members of your household.
Policy position**:** A director, officer, partner, manager, or agent in any managerial position.
Receipts: Include loans, gifts, royalties and earned income other than consulting fees. ***Exclude*** royalties from books or other scholarly works and unearned income. ***Exclude*** grants, contracts, or any other sums that you or your family members receive from **the** University, no matter what the original source.
Staff Services: Excludes infrequent secretarial support.

PLEASE PRINT

Name: _____

Title: _____

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Department/College: ———————————————————————————

CONFIDENTIAL
200_ Annual Disclosure Statement of
External Interests and Time Commitments
Part II

If you answered **YES** to any of the activities in Part I, Question **B**, please complete the corresponding section(s) in this form.

Please disclose:
1. Any outside sources of compensation (other than the activities reported in Part I, Question A, and excluding income from publications or other scholarly works). —> **Go to page 15**
2. Any external managerial responsibilities (including self-employment). —> **Go to page 17**
3. Any equity interest in any business related to your professional activities at the University whose value may have been influenced by the exercise of your professional duties at the University. —> **Go to page 17**
4. A policy position and/or receipt of more than $500 from any for-profit business (excluding consulting income) whose activities relate to your professional activities at the University. —> **Go to page 18**
5. Employment or use (in either paid or unpaid capacity) of the services of the University students or staff over whom you exercise supervisory or academic responsibility in your role at the University, for activities external to the University. —> **Go to page 20**
6. Use of the University facilities, equipment or staff services to support consulting at a for-profit business or some other commercial activity. —> **Go to page 20**
7. Any financial interest in any contract, sale or other transaction — that you are aware of — to which the University was a party and whose outcome you had any perceived ability to influence. —> **Go to page 21**
8. Any other situations, not listed above, that you may reasonably foresee as creating an actual or perceived conflict of interest or conflict of commitment between your role at the University and an outside interest. —> **Go to page 21**

I certify that the information on this disclosure statement is true to the best of my knowledge. I supply this information for confidential review by the University and I do not authorize its release for any other use. I agree to disclose future activity to my Department Chair before committing to it.

Signature:_____

Date:_____

Please complete and return this form to your Department Chair or Unit Head

Definitions

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Activities: The activities of a business ***include*** both direct activities of that business and the activities of any entities which that business controls.
Business: Any corporation, partnership, proprietorship, firm, franchise, association, holding company, joint stock company, receivership, trust, or any other legal entity organized for profit. It ***does not include*** mutual funds over which you have no control, or any governmental committee, community, political, academic, charitable, religious, social, or professional nonprofit organization.
Contracts: Excludes the terms of your own or any family member's employment contract with the University.
The University: Includes all units operated by the University.
Equity interest: Ownership or control of stock, stock options, or other investment instruments.
Facilities: Excludes your office, office equipment and incidental supplies (e.g. personal computers and local telephone service), libraries, and commonly available services (e.g. copying, FAX, long-distance telephone service) for which you reimburse the University.
Family: Spouse, children, siblings, parents, dependents, or members of your household.
Policy position**:** A director, officer, partner, manager, or agent in any managerial position.
Receipts: Include loans, gifts, royalties and earned income other than consulting fees. ***Exclude*** royalties from books or other scholarly works and unearned income. ***Exclude*** grants, contracts, or any other sums that you or your family members receive from The University, no matter what the original source.
Staff Services: Excludes infrequent secretarial support.

1. Consulting and Other Outside Compensation
Please show ***all*** sources of compensation (including self-employment) from outside activities that you have received from Jan. 1 - Dec. 31, 200_ and provide the number of days effort for each. (If you were paid or self-employed by the hour for a specific task, divide the number of hours paid or devoted to the task by 8 to obtain the number of days.) Please also estimate the number of days effort committed for 200_.
Do not include income from publications or other scholarly works, occasional lectures, seminars or participation in panels at universities and other nonprofit organizations for which you receive compensation. Also, do not include income earned while on unpaid leave or during the summer for those on 9-month appointments unless you are simultaneously receiving salary from a granting agency for services performed during that time. Furthermore, individuals not on the University payroll (e.g., emeritus, courtesy appointments, etc.) should not fill out this question.

FIRST SOURCE
Name of source:_____
Activity: CONSULTING _____
TEACHING _____
OTHER *(Please specify)* _____

Number of days effort: Jan. 1 - Dec. 31, 200_____ Committed 200_____
Description of activity: _____

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SECOND SOURCE
Name of source:_____
Activity: CONSULTING _____
TEACHING _____
OTHER *(Please specify)* _____

Number of days effort: Jan. 1 - Dec. 31, 200_____ Committed 200 _____
Description of activity: _____

THIRD SOURCE
Name of source:_____
Activity: CONSULTING _____
TEACHING _____
OTHER *(Please specify)* _____

Number of days effort: Jan. 1 - Dec. 31, 200_____ Committed 200_____
Description of activity: _____

FOURTH SOURCE
Name of source:_____
Activity: CONSULTING _____
TEACHING _____
OTHER *(Please specify)* _____

Number of days effort: Jan. 1 - Dec. 31, 200_____ Committed 200_____
Description of activity: _____

FIFTH SOURCE

Name of source:_____
Activity: CONSULTING _____
TEACHING _____
OTHER *(Please specify)* _____

Number of days effort: Jan. 1 - Dec. 31, 200_____ Committed 200_____
Description of activity: _____

SIXTH SOURCE
Name of source:_____
Activity: CONSULTING _____
TEACHING _____
OTHER *(Please specify)* _____

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Number of days effort: Jan. 1 - Dec. 31, 200_____ Committed 200_____
Description of activity: _____

Note: If you have more than six sources, please duplicate this page, attach, and indicate the number of attached sheets. _____

2. External Managerial Activities
Please list below any managerial responsibilities that you had from Jan. 1 - Dec. 31, 200_ or are committed to for 200_ in any for-profit business and provide the number of days effort for each. (If you were paid or self-employed by the hour or for a specific task, divide the number of hours paid or devoted to the task by 8 to obtain the number of days.)

FIRST BUSINESS
Name of business:_____
Nature of business:_____
Responsibility:_____
CEO _____
OTHER *(Please specify)*_____
_____
Number of days effort: Jan. 1 - Dec. 31, 200_____Committed 200_____
Description of duties:_____
_____

SECOND BUSINESS
Name of business:_____
Nature of business:_____
Responsibility:_____
CEO _____
OTHER *(Please specify)*_____
_____
Number of days effort: Jan. 1 - Dec. 31, 200_____Committed 200_____
Description of duties:_____
_____

3. Equity Interests in Related Business

Please provide the following information for any equity interest held in any related business by you, your spouse or your children, siblings, parents, dependents or members of your household from Jan. 1 - Dec. 31, 2008 that could have been influenced by the exercise of your professional duties at the University. Also, please provide the following information if you are committed to this activity for 2009.

3a. Business Name:_____

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3b. Publicly traded: YES ____
NO ____

3c. Value of equity interest:
Is your equity interest one exceeding $5,000?
YES ____
NO ____

3d. Percentage owned or controlled:
(Indicate ONE response)
__ LESS THAN 5%
__ BETWEEN 5% and 50%
__ OVER 50%

3e. Relationship of owner to you: *(Indicate ONE response)*
__ SELF
__ FAMILY MEMBER
__ BOTH

3f. Relationship of business to my research activities:
(Check ALL that apply)
_____BUSINESS SPONSORS THE UNIVERSITY RESEARCH FOR WHICH I AM A PI.
_____BUSINESS SPONSORS THE UNIVERSITY RESEARCH IN WHICH I PARTICIPATE BUT AM NOT PI.
_____BUSINESS SPONSORS RESEARCH OUTSIDE OF THE UNIVERSITY IN WHICH I PARTICIPATE.
_____BUSINESS DOES NOT SPONSOR MY RESEARCH, BUT MY RESEARCH COULD HAVE FINANCIAL IMPLICATIONS FOR THE BUSINESS.
_____OTHER *(Please specify)*_____
_____NONE OF THE ABOVE

3g. Relationship of business to my extension activities:
(Check ALL that apply)
_____ BUSINESS SPONSORS EXTENSION ACTIVITIES OUTSIDE OF THE UNIVERSITY IN WHICH PARTICIPATE.
_____ BUSINESS DOES NOT SPONSOR MY EXTENSION ACTIVITIES, BUT THESE ACTIVITIES COULD HAVE FINANCIAL IMPLICATIONS FOR THE BUSINESS.
_____ OTHER *(Please specify)*_____
_____NONE OF THE ABOVE

3h. Relationship of business to my supervisory/administrative activities at The University:
(Check ALL that apply)
_____ I AM INVOLVED IN DECISIONS REGARDING SERVICES (OTHER THAN SPONSORED RESEARCH) WHICH THE BUSINESS PROVIDES TO/RECEIVES FROM THE UNIVERSITY.

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_____ I ASSIGN OR SUPERVISE STUDENTS, RESIDENTS, FELLOWS, OR OTHER FACULTY WHOSE WORK COULD HAVE FINANCIAL IMPLICATIONS FOR THE BUSINESS.
_____ OTHER *(Please specify)*_____
_____ NONE OF THE ABOVE

4. Policy Positions and/or Financial Connections with Related Businesses

For the period Jan. 1 - Dec. 31, 200_, please provide the following information for any for-profit business whose activities relate to your professional area at the University in which you, your spouse or your children, siblings, parents, dependents or members of your household have been in a policy position and/or received loans, gifts, royalties or earned income of total value greater than $500 (excluding consulting income). Exclude any income that is reported in your answer to section 1 of this form. Please also provide this information for activities to take place in 200_.
4a. Business name:_____
4b. Publicly traded: ____ YES
____ NO

4c. Total value received:
(Indicate ONE response)
____ LESS THAN $5,000
____ EQUAL TO OR GREATER THAN $5,000

4d. Financial connection with the business:
(Check ALL that apply)
_____ CONSULTING/EMPLOYMENT (NOT APPLICABLE FOR ITHACA CAMPUS)
_____ LOAN
_____ GIFTS
_____ HONORARIA FOR PAPERS OR LECTURES
_____ DIRECTOR, OFFICER, PARTNER, AGENT, OR MANAGERIAL POSITION
_____ ROYALTIES
_____ OTHER (Please specify)_____

4e. Your relationship to individual who has financial connection with the related business:
(Indicate ONE response)
____ SELF
____ FAMILY MEMBER
____ BOTH

4f. Relationship of business to my research activities:
(Check ALL that apply)
____ RESEARCH ACTIVITIES HAVE NO FINANCIAL IM PLICATIONS FOR THE BUSINESS.
____ BUSINESS SPONSORS THE UNIVERSITY RESEARCH FOR WHICH I AM A PI.

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____ BUSINESS SPONSORS THE UNIVERSITY RESEARCH IN WHICH I PARTICIPATE BUT AM NOT A PI.
____ BUSINESS SPONSORS RESEARCH OUTSIDE OF THE UNIVERSITY IN WHICH I PARTICIPATE.
____ BUSINESS DOES NOT SPONSOR MY RESEARCH, BUT MY RESEARCH COULD HAVE FINANCIAL IMPLICATIONS FOR THE BUSINESS.
____ OTHER *(Please specify)*_____

4g. Relationship of business to my supervisory/administrative activities at The University: *(Check ALL that* apply)
____ MY UNIVERSITY SUPERVISORY/ADMINISTRATIVE ACTIVITIES HAVE NO FINANCIAL IMPLICATIONS FOR THE BUSINESS.
____ I AM INVOLVED IN DECISIONS REGARDING SERVICES (OTHER THAN SPONSORED RESEARCH) WHICH THE BUSINESS PROVIDES TO/RECEIVES FROM THE UNIVERSITY.
____ I ASSIGN OR SUPERVISE STUDENTS, RESIDENTS, FELLOWS, OR OTHER FACULTY WHOSE WORK COULD HAVE FINANCIAL IMPLICATIONS FOR THE BUSINESS.
____ OTHER *(Please specify)*_____

5. Outside Employment of Students or Staff
In the space below, please describe your utilization from. Jan. 1 - Dec. 31, 200_ of the services (in either paid or unpaid capacities) of any the University students or staff for activities external to the University over whom you exercise supervisory or academic responsibility in your role at the University and provide the number of days effort for each. (If you were paid or self-employed by the hour for a specific task, divide the number of hours paid or devoted to the task by 8 to obtain the number of days.) Please also report your commitments to use these staff or services in 200_.

5a. Employment or utilization of services of staff:
Jan. 1 - Dec. 31, 200_ Committed 200_
Number of staff involved: _____ Number of staff involved: _____
Total number of days: _____ Total number of days: _____
Nature of the activity: Nature of the activity:
____ UNRELATED TO MY THE UNIVERSITY DUTIES O UNRELATED TO MY THE UNIVERSITY DUTIES
____ RELATED TO MY THE UNIVERSITY DUTIES O RELATED TO MY THE UNIVERSITY DUTIES

5b. Employment or utilization of services of graduate students:
Jan. 1 - Dec. 31, 200_: _____ Committed 200_
Number of staff involved: _____ Number of staff involved: _____
Total number of days: _____ Total number of days: _____

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Nature of the activity: Nature of the activity:
____ UNRELATED TO MY THE UNIVERSITY DUTIES O UNRELATED TO MY THE UNIVERSITY DUTIES
____ RELATED TO MY THE UNIVERSITY DUTIES O RELATED TO MY THE UNIVERSITY DUTIES

5c. Employment or utilization of services of undergraduate students:
Jan. 1 - Dec. 31, 200_ Committed 200_
Number of staff involved: _____ Number of staff involved: _____
Total number of days: _____ Total number of days: _____
Nature of the activity: Nature of the activity:
____ UNRELATED TO MY THE UNIVERSITY DUTIES O UNRELATED TO MY THE UNIVERSITY DUTIES
____ RELATED TO MY THE UNIVERSITY DUTIES O RELATED TO MY THE UNIVERSITY DUTIES

6. Use of University Resources to Support External Activities
In the space below, please describe any use that you made from Jan. 1 - Dec. 31, 200_ or are committed to make in 200_ of the University facilities, equipment, or staff services to support consulting at a for-profit business or some other commercial activity.

_____
_____
_____
_____
_____
_____
_____

7. Other Financial Interests
In the space below, please describe the financial interests that you, your spouse or your children, siblings, parents, dependents or members of your household have and will have in any contract, sale, or other transaction—that you are aware of—to which the University was a party and whose outcome you had perceived ability to influence in 200_ or 200_.

_____
_____
_____
_____
_____
_____
_____

8. Other Situations
In the space below, please describe any other situations, not listed above, that you may reasonably foresee as creating an actual or perceived conflict of interest or conflict of commitment between your role at the University and an outside interest in 2008 or 2009.

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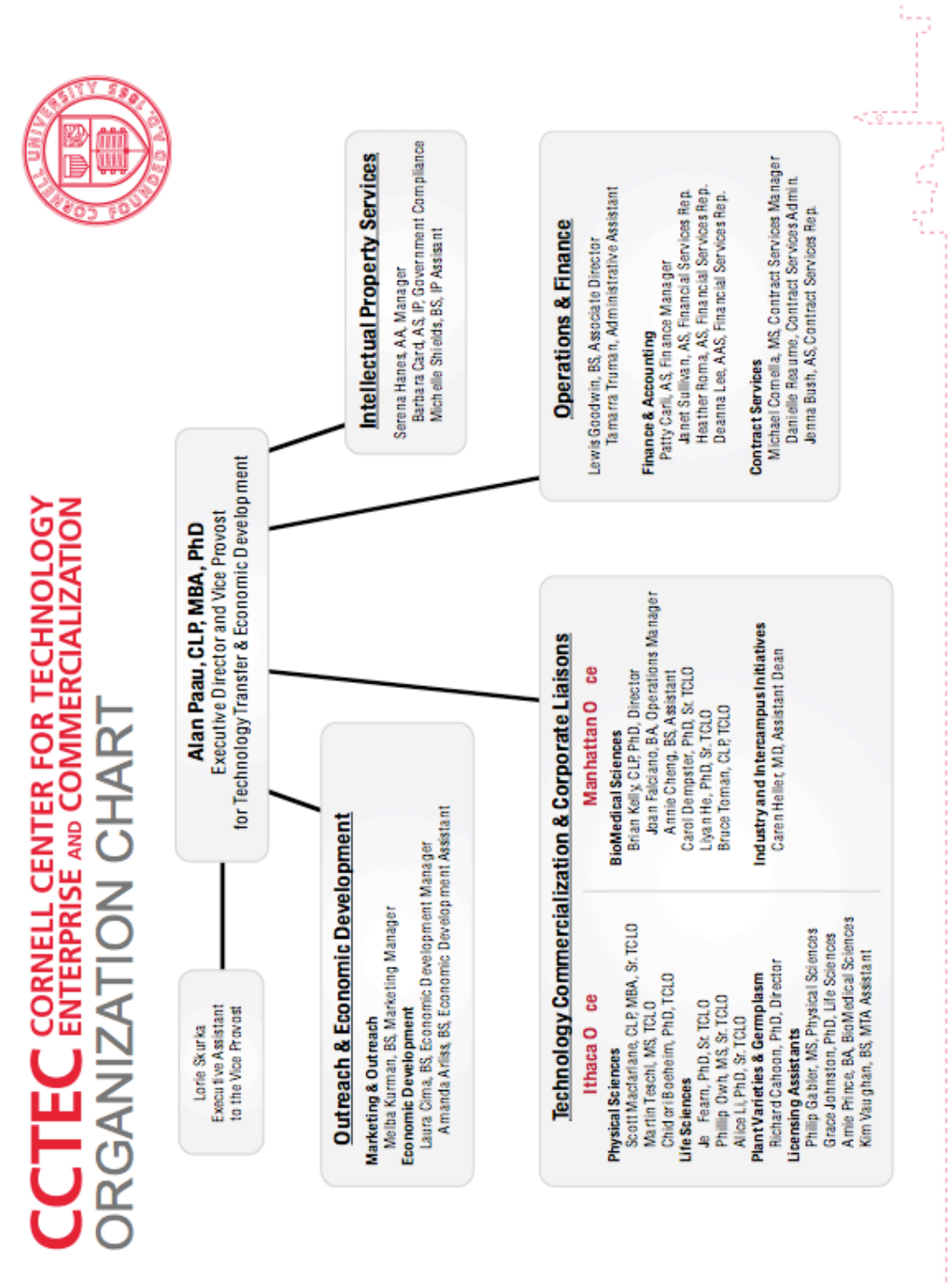
Appendix 3
Cornell Center for Technology Enterprise and Commercialization Organization Chart



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Appendix 4
Postgraduate Programs Linked to Productive Sectors

Introduction

University educational programs should properly respond to the present and future labor market in Chile's productive sectors. University careers themselves may need to be shorter and focused on specific areas while still meeting international standards. University and other state supported research and development should have a strategic focus regarding the allocation of state funding, which is aligned with the productive sector as much as possible. In addition the universities must be responsive by adopting a strategic focus with the role they play in both Chile and the productive sector.

This strategic focus may require resource allocation to be determined depending on the overall strategy that is adopted; one approach would support a set number of universities focused in research and education in several areas of knowledge, a second group of universities which specialize in areas relevant to the economic environment of their geographic area, and another group of universities focused on undergraduate education with less emphasis in research and development. In all cases there is a need to have an adequate system in place to measure the quality of education and to compare it to international standards

During the past few years there has been an apparently increasingly divergent track between academic and commercial interests and there is now real concern that in certain fields traditional academic education may not be optimized for the corresponding commercial world needs; this has been observed as an international issue and has been addressed in recent education curriculum developments. It is necessary that university education programs should properly respond to the present and future labor market in the country

Currently in the US while there are 13 million people unemployed, at the same time there are 3 million positions available (US Bureau of Labor statistics for February 2009) for which there appears to be a limited number of suitable applicants; these openings are in a variety of areas including education, health care, professional and business services, as well as manufacturing. According to the Adecco Institute in Europe 29% of German companies report they have problems filling technical jobs (Business Week, May 11th, 2009.). It appears there may be an international crisis where education and training is not keeping pace with industry requirements on either a quantitative or a qualitative basis. It is also possible that this is especially the case for the type of graduate needed for Small and Medium Enterprises (SMEs); i.e. those businesses which typically are responsible for the majority of economic growth, intellectual property generation and innovation, as well as being the group which employs the greatest number of people.

Major Chilean issues include:

- Postgraduates tend towards returning to academia rather than the Productive Sectors
- Employment within the Productive Sectors should be promoted as an equal to remaining within academia for certain high achieving post graduates
- Deliberately educating a generation of postgraduates whose aspirations are towards the Productive Sectors through

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- Program participant selection
- Motivation
- Education and training

For this Section of the Report the following points will be addressed:

1. Assessment of the linkage between Chilean universities and the productive sectors
2. Key areas of interest
3. Productive sectors requirements and IP
4. Recommendation for strengthening the linkage between Chilean universities and the needs of the productive sectors.

6. Assessment of Linkage between Universities and Productive Sectors

Universities have traditionally played a number of roles that have an immediate impact on productive sectors:

- Education of the work force
- The generation of innovative ideas and products

For the success of the former there needs to be communication between the two groups regarding the needs of the latter and exactly what type of curriculum is required to satisfy the immediate as well as future needs. Because there is a need for both a workforce as well as future leadership candidates, postgraduate education is needed to help develop a select group with the vision to drive the productive sectors towards the next generation of business opportunities and successes.

To make the best use of the latter, in order to ensure that innovative ideas with commercial potential are moved quickly and efficiently from the source of the innovation to the marketplace there needs to be a system that manages and facilitates the process. Situations where innovative ideas are developed slowly or not at all drain limited resources and ultimately weaken society rather than enhance it.

A strong link between the university departments and the corresponding productive sectors would provide an opportunity for the faculty and students to better appreciate the more practical and immediately useful aspects of their work. In return the members of the productive sectors can both help focus the university researchers on those areas of more urgent need while at the same time becoming aware in a timely manner of any potentially innovative applications of the university researcher's results.

Universities are traditional sources of innovative ideas and the productive sectors are traditional developers and exploiters of these opportunities; obviously the two groups need to be linked in one or more ways.

In many cases university faculty are focused on exploring new ideas and developing novel technologies in more or less an isolated academic environment; it has been noted elsewhere in this and other independent reports that the Chilean academic environment favors and rewards

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purely academic endeavors from university faculty members. The strengths of this approach include an apparently high productivity rate as measured by publications, as well as a stimulating teaching setting for students. Weaknesses of such a system include neglecting to some degree the applied and commercial aspects of the faculty's area of expertise, and this apparent disregard being passed on to the students who will provide the next generation of teachers, together with establishing intellectual property for future purposes. This latter point is brought home by comparing the publication rate with the number of patents filed.

Commercial operations, especially the Small and Medium Enterprises (SMEs) focused on start-up and growth issues are also not necessarily motivated towards involvement with the education of the next generation of workers; disadvantages include being distracted by partially educated students who could lower productivity in both a quantitative and a qualitative way, as well as distraction from the tasks at hand. However, were these firms to engage students within a formal framework and as part of a program designed by the members of industry, a *quid pro quo* system should evolve wherein the students will bring new ideas and a level of energy from which the company will benefit.

Assessment of the link between the university and the productive sector and the effect this has on such parameters as education of the current and future workforce, spin-off companies and commercialization of innovative ideas, is something which could be conducted jointly by university faculty, industrial sectors and government agencies. Generally agreed upon metrics are needed to measure the effect of the resulting strengthened link between the two groups. At least the increased interaction between the university and the productive sector and their perceived effect needs to be determined.

Obvious approaches to increasing this interaction include faculty having appointments within the industry up to and including physically being employed within the commercial organization between semesters, and their industrial counterparts being assigned Visiting Professor or similar positions within the university department in question.

This cross fertilization provides the university teachers the opportunity to learn the real-world needs of the productive sectors thus providing the feedback needed to modify teaching curricula as necessary, while at the same time allowing the representatives from the productive sectors insight into the latest developments within a particular field. In exchange the input from the commercial world representative will help the academic researcher fine tune discoveries with commercial potential.

It is also important that students be given the opportunity to spend time working for the relevant productive sector and this is discussed in more detail below. In addition to actual time spent working within the sectors, postgraduate students could be assigned the role of studying the interactions between the university and the productive sectors as a requirement for graduating; doctoral students in particular could investigate many details of the process, in a timely way and without draining resources, as well as for long term monitoring during the evolution of the overall process.

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7. Key Areas of Interest

The successful interactions between the universities and the productive sectors, the need for an educated workforce and the role of postgraduate education in the process are ongoing facets of a major investment into Chilean society, especially as it continues to develop a highly skilled and educated population who will lead Chile towards the future. Careful analysis of current policies and their success or failure as well as the introduction of new programs addressing present and future problems and opportunities has to be undertaken.

Key areas of interest that need to be assessed include:

- Education of the current workforce
- Postgraduate education of a leadership cadre for the productive sectors
- Postgraduate education of the entrepreneurs and risk takers
- Postgraduate education of those in support roles such as business policy and analysis
- Assessment of the success of the university programs
    - As seen by the university
    - As seen by industry
    - As seen by the graduates themselves
    - As seen by government funding agencies
- Role of government agencies
- Funding of those programs which will create the momentum needed

The primary Productive Sectors include fruits, aquaculture, forestry, food industry, mining, engineering, IT and related areas of biotechnology.

Key groups of interest include:

- The relevant *specific* University Department; *e.g.*, organic chemistry plays a role in the fruit and food industries as well as many biotechnology applications
- University Departments with wide application regardless of the Productive Sector; *e.g.,* the Business Schools
- Commercial operators within the Productive Sectors
- Professional Organizations representing the Productive Sectors
- Governments groups with a financial, supporting and monitoring role for both the universities and the Productive Sectors

From these groups an Executive Board of Directors should be drawn to act as the key advisory committee for the overall University-Productive Sector and Graduate Education programs, including identifying general and specific requirements for the education process including adopting approved curricula, lobbying the government for funds to support faculty and as importantly the students, monitoring the progress of new initiatives against the stated goals for the programs and for introducing new procedures as the programs mature and their effects can be seen.

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8. Productive Sectors Requirements and IP

The needs of commerce are best known to the Productive Sectors themselves and although specific opportunities and problems will eventually percolate to the academic environment, this may not occur in a timely manner and industry/academia leaders should investigate this concern. At some level the Productive Sectors should be involved with the education of university graduates that can be accomplished by the teaching mechanisms involving *Industry Immersion Learning* (discussed below).

Appropriate curriculum issues are addressed below. An additional problem that occurs frequently but is not often addressed appropriately is that newly hired graduates who enter the commercial world frequently have their own issues concerning their new environment and how to successfully incorporate themselves into it. There are a number of approaches to alleviate this problem, most involving some type of industrial internship for the student.

In addition, a strong entrepreneurial workforce who would aggressively seek new business opportunities is required in Chile. Although during ILB's investigations a number of strongly entrepreneurial individuals were interviewed there seemed to be a tendency for the highly skilled and educated to be employed in large and established organizations rather than to Small and Medium Enterprises (SMEs) that are typically more innovative businesses that drive the economy. Thus although there are entrepreneurs who can push the conversion of innovative ideas towards commercialization, the total numbers seems small when compared to the total educated workforce.

This apparent lack of entrepreneurs and concomitant associated activities could be the result of a number of factors some of which may not be readily addressable, such as the perceived value of an individual in a position in an established institutional hierarchy compared to a position in a start-up. On the other hand if these individuals are not aware of the potential for creating value through SMEs there may be no motivation to "Think Outside of the Box". By formally training graduates and others already in the workforce in the background and mechanics of SMEs Chile could produce a generation of highly educated and risk taking business people who will drive innovative new companies.

9. Recommendations for Strengthening the Linkage between the Universities and the Productive Sectors

(i) A formal mechanism for monitoring, measuring and fostering the linkage between the universities and the productive sectors on an ongoing basis will be required. This could be accomplished with something as simple an annual or bi-annual meeting between the productive sectors and the university representatives associated with those industries. These groups may already be in place to some degree, especially for the exchange of latest research and ideas.

However, formalized Professional Associations with government funding, if not currently undertaken should be considered. The documentation and coordination of shared goals and

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specific industry requirements would be very helpful, and again this may already be in place to some degree. Information and details of these activities could be made available to the industry, academia and the funding agency, and government policy makers in government.

(ii) The development of so-called *Professional Graduate Education* programs that draw heavily on *Industry Immersion Learning* should be considered.

The goal of the *Professional Graduate Education* programs is to expose the student to both academic and business training. For example at North Carolina State University the Professional Science Masters degree in Microbial Biotechnology provides students with competencies in science and business and includes both academic and professional training. The degree content is tailored to the needs of the productive sector or industry and thereby produces graduates who are immediately useful and productive members of that industry. These programs are rapidly multiplying in the US because it has been recognized and documented that the graduates can easily enter the productive sectors and do so at a higher rate than those from traditional programs.

These programs could be at both the masters and doctorate level and originate from any of the traditional university departments, together with the involvement of interested parties from the productive sectors.

From the perspective of new graduates who secure their first position in the Productive Sector, upon entering commerce they discover that the environment is completely different from that of academia, and consequently they spend a period of low productivity as they learn and adjust to the new surroundings. This is very common and used to be referred to as “getting up to speed”. Furthermore, without prior knowledge of the challenges and opportunities found in the commercial world, there is a real risk that the newcomer misses completely chances to grow with their employer with negative consequences to both.

A common core of academic study would be shared between the two levels, i.e. masters and doctorate, and topics for student research could include, on a national and international level, intellectual property management and exploitation, technology transfer and start-up activity, small and medium enterprises (SMEs) and their short and long term effect on the economy, and government support mechanisms and their potential and documented effects, for example.

Many of the issues faced by Chile are not unusual although the opportunities and advantages of the Chilean situation are unique. By drawing on the experiences and changes in the traditional relationship between academia and the Productive Centers in other parts of the world new approaches to similar relationships within Chile should be investigated. In this manner the best of the global current developments will be fine tuned to the needs and opportunities of Chile.

One solution is to expose the student to the industrial setting while they are still studying and as a course requirement. Many approaches have been taken to ensure that this happened in the past including the so-called sandwich degree courses in which a student spends their third year of a four year degree course in industry, as well as other variations throughout the world.

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As a part of a new type of Professional Masters degree course in the US an industry immersion period, which accounted about half of the course requirements, was introduced as an innovative way to address some of these issues.

As pointed out in the introduction of *Industry Immersion Learning* published by Wiley-Blackwell in early 2009 in the US and Europe (copies of this book are included as an appendix to this report) the industry immersion method is

> "*Characterized by need-based, innovation oriented, and proactive acquisition of knowledge. The education is coordinated and supervised by academic and industry professionals in concert and promotes a high level of interaction between students and industry professionals. As the name of the method implies, students are immersed in the industry environment and tasked to excel in matters of high relevance to the company in which the training takes place. Students must adapt quickly to the new environment, create a professional network on site, become knowledgeable about the topic of study, employ innovative thinking, and meet or exceed expectations in their deliverables in a timely manner in order to succeed*."

Typically a student spends 180 hours of study during each of their internships, of which there are a number to be completed before graduation. At the end of each internship, the student prepares a report and discusses their experience with their classmates, and in this way the student is able to share and benefit from the different work experiences within the group.

The productive sectors would be surveyed to determine which skills they would require from a newly hired graduate and this information used in developing the curriculum. For example the skills required from a biotechnology graduate might include:

- Academic including science, business, and analytical thinking
- Practical experience from an internship, bench research and office work
- Technological competency including R&D process, manufacturing and clinical trials process
- Specialty studies such as IP, accounting and finance, GMP/GLP and regulatory knowledge
- Skills such as leadership, teambuilding, communication
- Entrepreneurial, global orientation, out-of-the-box focus mindsets.

Building the university-industry alliance, while part of the professional postgraduate program is also important in a more general way.

For successfully engaging a professional from the productive sector there should be considerations other than purely monetary. Advantages to the professional to be engaged in this activity include exposure to resources and new ideas from the students themselves, the chance to train students in areas of immediate importance to the professional who is teaching them, and the opportunity to evaluate potential new employees.

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Especially in the case of industrial internships in the productive sector, but also of consideration for the classroom, is maintaining the security of intellectual property that should be protected through a formal agreement or in the case that either party is uncomfortable entering such an agreement by simply not disclosing anything confidential.

The topic and environment in which the industry immersion learning takes place has to be determined by the academic advisor in conjunction with the industry professional. Projects could include for example technology development, product assessment, or business development. The work environments will differ markedly especially those in SMEs and this will provide the student with a variety of experiences to draw upon after they graduate and enter the workforce.

These and other issues are discussed more fully in the attached book coauthored by Dr. Cedric Pearce: *Industry Immersion Learning: Real-Life Industry Case-Studies in Biotechnology and Business*.

(iii) The issues facing the development and commercialization of innovative ideas and related marketable products can also be addressed by home-grown candidates, experienced Chilean business people, although in their absence other approaches should be considered including the motivation of successful entrepreneurs and business people to re-enter the work force, and the re-importation of entrepreneurial Chilean nationals currently residing in other parts of the world.

Educating entrepreneurs and those involved in intellectual property management, innovation commercialization and related areas could be considered as a sub-section of the professional postgraduate education referred to in section (ii); however there are differences and therefore this has been addressed separately.

As discussed above there is a need for additional graduates educated with the productive sectors in mind, and especially for the SMEs which have a particular requirement of well rounded but at the same time highly educated employees who have the flexibility to operate successfully in that environment.

Postgraduate education for these individuals should have (at least) two objectives:

- To ensure that industries technological needs are catered for and thus ensure that they remain competitive
- The development and positioning of well-qualified leaders essential for the competitive advantage of the industry sector.

There is a need for postgraduate education aimed at generating a body of professional entrepreneurs who will link academia and industry and who will move innovation into the market place in an orderly and aggressive manner needed to compete on a global level. Thus a new cadre of entrepreneurial business people is vitally important for Chilean economic growth.

During the past decade a number of the Professional Masters programs referred to above have evolved internationally; Chile could move beyond these programs and by drawing on established university courses, experienced entrepreneurs and in a mixed classroom setting develops an entirely new and revolutionary program whose graduates will change the face of how business is

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conducted in Chile; these studies would lead to a postgraduate degree in *Innovation, Intellectual Property Management and Entrepreneurship*.

Chile could establish these programs simultaneously and quickly throughout the Chilean higher education system. By generating large numbers of qualified entrepreneurs in all fields innovative opportunities would be seized upon and their development accelerated into the local and the global market place. An outline of a roadmap for the development of this program is given below.

Chile has excellent natural resources and the importance of these has been noted in earlier Consulting Reports. Each of these Productive Sectors, such as fruits, aquaculture, forestry, food industry, mining, engineering, IT and related areas of biotechnology has unique issues and requires specialized personnel and teams to properly develop and commercialize such opportunities. One of the major issues is to develop postgraduate training that covers a broad range of topics in a way that is economical of resources; this could be accomplished using the following two strategies:

1. Formal university education. Graduate classes should be small to encourage strong collegial interaction so that students can learn from each other's experiences; by having a mix of various disciplines representing the arts and the sciences, the students will be able to gain from each student's individual perspective and highlight the issues associated with innovation and entrepreneurship. A typical class could integrate the following types of graduate: biotechnology, chemistry, microbiology, agriculture/agronomy, mechanical and electrical engineering, computer studies, mining and geology, language, history and fine arts.

A typical syllabus might include the following:

- History of risk and reward
- Intellectual property
    - patent law and IP management
- Conflict of interest
- Innovation in business and commerce
- Philosophy of business
- Entrepreneurship
- Finance and funding sources
    - Book keeping
    - Venture capital, bootstrapping, loans
- Negotiation and deal making
- Management of SMEs
    - Anatomy of the company
    - Start-ups
    - Growth company
    - Mature organization
- Industrial work experience and internships

2. Industrial Internship. As discussed earlier a vital part of this course is the industrial learning experience, which should include a variety of internships spent within the following commercial environments:

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- SMEs
- Venture capital firms, angel networks, government funding agencies
- Law firms specialized in Intellectual Property management

Students will be paired with experienced industrial mentors; the mentors should be selected on the basis of their willingness to provide the student with a stimulating and thorough apprenticeship which while necessarily short will be intense. The internship should be (one term in length – need to fit the Chilean school year) and preferably each candidate should complete three such studies with a report to the class at the end of each experience.

International studies would be encouraged. Many of the faculty in Chilean universities collaborates with universities in other countries and this will provide students an opportunity to gain valuable experience not available locally. In addition many international companies operate in Chile and these connections should also be exploited to provide students with international experience.

This combination of traditional class material together with real word experience should produce graduates who are eager and able to take innovative ideas forward towards commercialization, as well as fit into the early stage company and thrive in that environment.

The natural home for the proposed postgraduate degree in *Innovation,Intellectual Property Management and Entrepreneurship* is the university Business School which would be assigned the task of developing and assembling the materials needed to undertake such education. Multiple disciplines will ultimately be involved and this would provide university academicians with an opportunity to cross-fertilize the program with innovative ideas for course material and student learning experiences taken from a broad range of subjects.

The Board of Directors/Advisors ideally would include both academics and industry representatives (see **Key Areas of Interest)**; the latter would help identify relevant problems, the former could present solutions, and together the group would move these programs forward in a coordinated and well-reasoned manner.

(iv) Other Issues:
In turn it may be necessary to make some changes to support the introduction of the proposed postgraduate education in Chilean Universities, and for this to happen:

- university and industry links need to be enhanced
- there should be a better understanding of industries' needs

Both the above issues can be addressed if one or more of the major universities establishes a ***Chair of Innovation and Entrepreneurship***; because of the very nature of innovation this could be a revolving appointment, possibly but not necessarily within the Business School and equally it could be within an engineering, computer studies, geology, pharmacy or medical school, or any other university department where there are multiple opportunities for commercializing technology. It is important to add to the traditional university goal of exploring new ideas to include one of developing and commercializing new ideas.

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Funding issues will need to be addressed.

- change grant objectives and assignment system
- augment number of home based grants

It may be possible to provide student loans that can be deferred until the graduates have established themselves in the SME; some rules will need to be included so this opportunity is not routinely abused. Also, during the Industrial Learning Experience it should be possible in most if not all cases for the student to receive a stipend from the host company.

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Appendix 5
Patent Application Blank

TITLE

CROSS-REFERENCE TO RELATED APPLICATIONS

[001] X

BACKGROUND OF THE INVENTION

[002] Field of the Invention

[003] X

[004] Description of the Related Art

[005] X

SUMMARY OF THE INVENTION

[006] X

BRIEF DESCRIPTION OF THE DRAWINGS

[007] X

DETAILED DESCRIPTION OF THE INVENTION

[008] X

EXAMPLES

[009] X

CLAIMS

1. Claims go here.

ABSTRACT

X

Appendix 6
Contracting States (140) of the WIPO Patent Cooperation Treaty (PCT)

Albania
Algeria
Angola
Antigua and Barbuda
Armenia
Australia
Austria
Azerbaijan
Bahrain
Barbados
Belarus
Belgium
Belize
Benin
Bosnia and Herzegovina
Botswana
Brazil
Bulgaria
Burkina Faso
Cameroon
Canada
Central African Republic
Chad
Chile (from June 2, 2009)
China
Colombia
Comoros
Congo
Costa Rica
Côte d'Ivoire
Croatia
Cuba
Cyprus
Czech Republic Democratic People's Republic of Korea
Denmark
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Estonia
Finland
France
Gabon
Gambia
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Honduras
Hungary
Iceland
India
Indonesia
Ireland
Israel
Italy
Japan
Kazakhstan
Kenya
Kyrgyzstan
Lao People's Democratic Republic
Latvia
Lesotho
Liberia
Libyan Arab Jamahiriya
Liechtenstein
Lithuania Luxembourg
Madagascar
Malawi
Malaysia
Mali
Malta
Mauritania
Mexico
Monaco
Mongolia
Montenegro
Morocco
Mozambique
Namibia
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Norway
Oman
Papua New Guinea
Philippines
Poland
Portugal
Republic of Korea
Republic of Moldova
Romania
Russian Federation
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
San Marino
Sao Tome and Principe
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Slovakia
Slovenia
South Africa
Spain
Sri Lanka
Sudan
Swaziland
Sweden
Switzerland
Syrian Arab Republic
Tajikistan
The former Yugoslav Republic of Macedonia
Togo
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Uganda
Ukraine
United Arab Emirates
United Kingdom
United Republic of Tanzania
United States of America
Uzbekistan
Viet Nam
Zambia
Zimbabwe