DEVELOPING FRAMEWORKS TO FACILITATE UNIVERSITY-INDUSTRY TECHNOLOGY TRANSFER

A CHECKLIST OF POSSIBLE ACTIONS

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The development of frameworks at the national and institutional levels that facilitate and encourage university-industry partnerships, particularly in the field of technology transfer, is a complex matter for which there can be no pre-defined recipe. Historical, economic, cultural and political circumstances will affect the policy choices available in each context and influence their outcome and success in implementation. Nevertheless, the experience of the countries that participated in the WIPO study on "Technology Transfer, Intellectual Property and Effective University-Industry Partnerships", as well as lessons learnt from the experience of other countries, provide the basis for developing a general checklist of possible measures that countries may wish to consider.

Encouraging technology transfer from universities to the private sector has been identified in many countries as a desirable goal, not only to enhance the competitiveness of the private sector through access to innovative research results but also to ensure that university R&D results are made available to society through their commercialization. Intellectual property (IP) rights have become a widely used tool in many countries to promote university-industry partnerships as they can provide the necessary incentives to facilitate an effective transfer of technology. A key challenge for governments and institutions is to adequately support the technology transfer process through various mechanisms, including the use of IP rights, while not losing sight of, and reinforcing, the educational and research mission of universities. The objective of the following checklist is to provide policy-makers, both at the national and institutional levels, a set of general measures that may be useful while developing policies for enhancing university-industry partnerships through the use of intellectual property rights. The focus is on how to create the appropriate climate for the management of patents by universities and their effective transfer to industry.

The checklist is meant as an illustrative non-exhaustive set of measures that address three key areas of policy-making, namely:

I. National Policy on Intellectual Property and University-Industry Technology Transfer
II. University Policy on Intellectual Property and Technology Transfer
III. Institutional Set-up and Practical Aspects for Technology Transfer from Universities to Industry

I. NATIONAL POLICY ON INTELLECTUAL PROPERTY AND UNIVERSITY-INDUSTRY TECHNOLOGY TRANSFER

- Efficient intellectual property system. A pre-requisite for any national policy framework that aims to facilitate the transfer of technology from universities to industry via the use of intellectual property rights is the existence of an effective intellectual property system, comprising of modern legislation in the field of patents, trademarks, copyright, industrial designs and trade secrets; an intellectual property office in charge of examining and registering/granting IP rights; and the availability of qualified IP professionals (e.g. attorneys, agents, in-house experts, etc.) that are in a position to assist universities

throughout the patent life-cycle, including, in particular, the application process, the negotiation of licenses over patented technology and, possibly, the enforcement of patent rights in case of disputes.

- University legal status. For universities to be in a position to own and manage intellectual property rights and transfer technology to industry for commercialization, it is essential that they have the necessary legal status to do so. Experiences from a number of countries have shown that lengthy bureaucratic procedures requiring state-owned universities to consult government committees or similar bodies prior to each patent application and/or contract negotiation, as a result of a lack of legal autonomy to conduct such activities independently, may become strong disincentives and a major obstacle to IP protection and technology transfer.

- Clear and transparent policy on IP ownership. Clear and transparent rules over the ownership of any intellectual property rights developed within public universities or funded with public resources are critical. Different countries have different ways of legislating on this matter, ranging from provisions in patent legislation and in employment legislation to specific legislation dealing with university IP and technology transfer. In addition, government research funding agencies may also have rules that are specific to any research conducted with such funding. Regardless of the legislation in which the issue is included, there is a strong argument to be made in favor of having a nation-wide policy that clearly establishes issues of ownership of IP rights developed by university researchers. This would not only provide clear and predictable rules of the game for all stakeholders but will also facilitate joint research between different institutions.

  Different countries have adopted different approaches on whether the university, the researcher, the State or the funding agency will be considered the owner of IP rights developed within universities with public funds. In recent years there has been a clear trend towards ownership by the university (although there are often exceptions, for example, for inventions made by researchers in their own time using their own equipment, or for inventions developed within the framework of a collaborative or sponsored research agreement). Some of the main reasons for assigning ownership to the universities include:
  - Generating additional income for the university;
  - Creates the necessary incentive for the institution to support the transfer of technology;
  - Costs of patenting are too high for the individual researcher to fund (particularly if patenting abroad);
  - There are generally many researchers involved in any research project, which would lead to fragmentation of ownership and possible problems for transfer and commercialization if technology was owned by researchers; and
  - Ownership by the university and management of IP rights by the institution facilitates the professionalization of technology transfer activities and enables researchers to focus on their core research skills.

- Research funding agencies. In a number of countries, research-funding agencies actively promote the patenting of research results and in some cases include funding for the protection of research results as part of the funding package. In addition, research-funding agencies sometimes also require researchers to conduct a prior art search using patent databases prior to funding a project. This provides a higher degree of assurance that funding is not channeled to research which has already taken place elsewhere, or is carried

out in an area which may be "crowded" and may not yield desired economic gains. With respect to policies on IP ownership of funding agencies, these should be in line with national policy, as inconsistencies between the rules of different funding agencies could result in conflicts over ownership when research is funded from more than one source. Lack of clarity over ownership is generally perceived by industry as a strong disincentive for becoming involved in commercialization.

- Development of skilled human resources. Managing technology transfer activities from universities to the private sector requires skilled human resources and interdisciplinary teams with legal, business, and scientific and licensing expertise. Lack of qualified human resources for such tasks is one of the greatest bottlenecks identified in a number of countries, including countries that participated in this study. Initiatives to train the required human resources should not be perceived as the exclusive responsibility of individual institutions as efforts may be made at the national level to generate the necessary skills for such activities.

- Patent funds and/or fee discounts. A number of countries worldwide have launched initiatives to establish competitive funds that universities and other public research organizations (PROs) may apply for in order to obtain financial support for patenting domestically and, in some cases, internationally. National funds for university patenting may be considered a useful mechanism for promoting the use of the patent system particularly where it is being under-utilized by universities as a result of financial constraints. Such funds, where they are established, should take into account the entire costs of patent protection (i.e. official filing fees, costs for hiring an expert to conduct a prior art search and/or to draft the patent application, official maintenance fees, and translation costs if funding will include support for patenting abroad). An alternative that has been implemented in many countries is offering discounts or exemptions from official filing and maintenance fees to universities and PROs.

- Requirements to commercialize inventions. In a number of countries' legislation and in the regulations of some research funding agencies, universities are required to commercialize or exploit inventions. In some cases, such requirements or obligations may act as incentives for institutions to make considerable efforts to commercialize their R&D results and devote human and financial resources to such tasks. Exploitation requirements may, in some cases, also go hand in hand with requirements to report and/or disclose any inventions or IP rights to the research funding agencies. Despite difficulties in monitoring such provisions, they have proved useful in some countries to encourage technology transfer.

- Safeguarding the public interest. The ultimate goal of policies and legislation in this field is generally to facilitate the transfer of technology to industry in order to ensure its commercialization for the benefit of the public interest. With this in mind, and considering that research is often funded by public sources, policies often contain provisions to ensure that the public interest is safeguarded. For example, in some countries, universities have a specified time during which they may exercise their ownership, otherwise title is transferred to the government or funding agency. Moreover, in some countries, the government reserves for itself a royalty-free license to practice, or have practiced on its behalf, any publicly-funded invention in exceptional circumstances (also called "march-in rights").

- Guidelines and Codes of Practice. Some governments have issued guidelines, codes of practice or a set of principles to supplement laws or provide support to institutions on the exploitation of IP rights. The aim of such guidelines is generally to ensure that universities have access to best practices for the identification, protection and management of IP rights.

- Programs to support the establishment of technology transfer offices. In a number of countries, programs have been introduced to fund the establishment of technology transfer offices. Technology transfer offices are broadly defined as bodies that are in charge of managing the transfer of technology to industry and are often in charge of managing a university's IP assets. Ideally, technology transfer offices would be self-sufficient and eventually generate additional income for the university. However, experience shows that not all technology transfer offices manage to become self-funded, and even when they do, start-up funds are generally required for a number of years. In some countries, governments support the establishment of technology transfer offices by means of financial and/or technical assistance. National patent offices, in particular, are often called upon to provide technical support to technology transfer offices, particularly in the early phases.

- Strengthening education on IP. The need to strengthen IP education within universities is also important, not only among law and business students but also among scientists and engineers so that researchers become acquainted with how the intellectual property system works. Spreading the use of patent databases by science students as a source of technological information is a key measure for enhancing their knowledge of latest technological developments and bringing scientists closer to the intellectual property system.

- Grace period. The publication of research results prior to filing a patent application may compromise their patentability, as a subsequent patent application would no longer meet the novelty requirement. As a result, some countries have provisions for a grace period, (i.e. a period during which an invention can be disclosed by a researcher, for example through publication, without compromising the invention's patentability). This is thought to be a useful mechanism to facilitate patenting by researchers who are under pressure to publish their results. In countries where a grace period exists, researchers may publish their research results and subsequently submit their patent application within a specified timeframe (generally 6 months or a year). Detractors of the grace period, however, argue that the introduction of grace periods increases legal uncertainty. Countries' legislation differ significantly on this issue and grace periods exist in different forms in some countries (e.g. US, Japan, Russia and China) but do not exist in others (e.g. countries that are members of the European Patent Convention). Patents may be denied to inventors who have relied on the grace period provisions when they apply in countries where such provisions do not exist.

- Framework for the establishment of spin-offs. The creation of spin-offs is considered an important avenue for commercialization of new technology particularly when the nature of the technology is such that no current player in a particular market would be willing to take the risk of taking a given invention to market. National policies may have to address issues that may arise in relation to the establishment of university spin-off companies. For instance, it may be necessary to determine whether State-owned universities are entitled to own equity over spin-off companies and whether, and in which circumstances, State-

funded university researchers may participate in private enterprises (more on this below under Section II).

- Seed funding for spin-offs and start-ups. Given the financial risks involved in the establishment of start-up companies and university spin-offs, it is often difficult to find the necessary seed funding in financial markets. In some countries, governments have established competitive funding mechanisms to which start-up companies may apply to obtain venture funding. The existence of such funding mechanisms, particularly for the establishment of new technology-based firms based on university patented technology, can have an impact on the likelihood of such enterprises developing and surviving beyond the start-up phase.

II. UNIVERSITY POLICY ON INTELLECTUAL PROPERTY AND TECHNOLOGY TRANSFER

- Clear and transparent IP policy. A crucial first step for any university intending to build partnerships with the private sector for technology transfer of patented inventions is to have a clear and transparent IP policy that is formally approved by the university authorities and available for consultation by researchers and external partners. In many cases, IP policies are the result of a participatory process involving all the main stakeholders within the institution. University IP policies generally cover all IP rights, in particular patents and copyright, but may also regulate the transfer of know-how. The IP policy ~~is to become~~ should be a dynamic document that can be reviewed ~~if~~ as necessary, providing clarity on a number of issues. Some of the main objectives of an internal IP policy are to:

    - Provide rules and guidelines for the commercial exploitation of IP generated within the university;
    - Ensure that discoveries, inventions and creations generated by staff and students are utilized in ways most likely to benefit the public;
    - Establish ownership criteria;
    - Define the responsibilities, rights and obligations of all stakeholders;
    - Develop basic guidelines for the administration of the IP Policy; and
    - Define rules for benefit sharing if the commercialization of IP generates income

- Criteria for ownership. While the general provisions on ownership of research conducted by university researchers with public funds are likely to be addressed by national legislation, the university's internal IP policy generally reaffirms the main principles, states the university's intentions with respect to the exercise of its IP rights and addresses a number of particular circumstances, such as:
    - Cases in which IP rights are generated as a result of research sponsored (all or in part) by private sector companies in the framework of research contracts;
    - Cases in which IP rights are generated as a result of funding by a public sector agency that might have specific contractual terms associated with the funding;
    - Cases in which IP is generated by researchers who are not bound by employment contracts, such as under-graduate or post-graduate students; and
    - Cases in which inventions are developed in partnership with third parties (individuals or institutions).

- Income distribution (or royalty sharing). Provisions on income distribution (or royalty sharing) are a key element of most IP policies. Income distribution provides an important incentive for researchers to ensure that they disclose their inventions to the relevant body and seek to find the best avenue for commercialization. Provisions on income distribution generally define clearly what type of income is to be distributed and generally applies not just to royalties but to any other lump-sum or milestone payment made to the institution for the commercialization of the technology. Common practice in this regard is that income generated must first cover any expenses related to the protection and exploitation of the IP and the net income is subsequently distributed between the researcher(s), the department, the university, the technology transfer office and/or other stakeholders in percentages that are established in the policy. IP policies often establish revenue thresholds, and the percentage received by the researcher(s) decreases as total net revenues increase. University IP policies may also define how decisions are to be taken on how to split the income when more than one researcher is involved.

- Conflicts of interest. A conflict of interest occurs whenever two or more goals or ends cannot be pursued simultaneously, and they are in potential competition. It has also been described as a situation in which a public obligation competes with financial interests. Productive interchange between the university, the faculty, or other employees and the private sector may sometimes engender conflicts of interest, in which legitimate but disparate goals of some of the actors involved may be in conflict. In particular, universities are often concerned that research is not skewed towards the interests of private companies or that the university (or its faculty) is not distracted from its core mandate. In technology transfer activities, there may be specific types of conflict of interest that need to be addressed, including situations in which university researchers (or their relatives) have a financial interest in any of the university's licensees. To avoid such circumstances, or minimize their impact, universities need to develop policies and procedures for the disclosure and management of conflicts of interest. This may be crucial for the credibility and image of the university and its researchers as well as to ensure that technology transfer activities are conducted in the public interest and not exclusively for personal gain. Policies on conflict of interests generally cover a wide range of issues that go beyond those that relate strictly to intellectual property rights and technology transfer.

- Responsibility for the administration of IP. IP policies generally determine which body of the university will be responsible for the protection and management of the university's IP rights. In many cases, such responsibility is assigned to the technology transfer office (see section III for more information on technology transfer offices). Responsibility for evaluating invention disclosures and taking decisions on whether or not to patent is generally also spelt out in the IP policy.

- Obligations of the university and of the researchers. University internal IP policies may state certain obligations for the researchers as well as for the institution itself. Obligations of an inventor may include, for example, (1) the need to disclose to the appropriate body determined in the policy any research results that could be protectable by IP rights; (2) not to disclose the invention to third parties in a way that may compromise its patentability; (3) to abide by any agreements signed with external parties; (4) to assist in the protection and management of IP; or (5) to disclose any conflicts of interest. Obligations of the university (or of its relevant bodies) may include, for example, (1) to evaluate every disclosure; (2) to minimize delays; (3) to maintain confidentiality over inventions; (4) to

facilitate transfer so as to benefit the public; and (5) to assign ownership to the inventor, research funding agency or government if it decides not to patent or license.

- Sponsored research contracts. Collaborative or sponsored research involving a university and a private company are increasingly common in many universities. On many occasions, the private company funds research that is undertaken within the university by university researchers using university equipment. It is important to have clear rules on IP ownership in such cases as well as guidelines on whether the sponsor is entitled to an exclusive or non-exclusive license, whether it would have to pay royalties to use the technology that results from such research and whether it would have the right to license or sub-license to third parties. These and other issues will need to be spelt out in the contract but should be agreed upon beforehand as a matter of university policy. Many universities try to maintain some degree of control over IP generated through sponsored research contracts, requiring, at least, joint ownership.

- IP and career advancement. The inclusion of quantitative data on patents and licenses as criteria for recruitment and career advancement of researchers may also be considered an important incentive for researchers to engage in such activities. The underlying rationale is that unless researchers are rewarded professionally for patenting and commercializing their research results they are unlikely to pursue this route, favoring a speedy publication of the research results instead that would hinder the opportunities to patent and transfer the technology thereafter. Different countries and institutions have adopted different systems for evaluating patents and licenses for the purposes of career advancement, taking into consideration that it may also be important to avoid creating incentives for indiscriminate filing of patent applications given the costs involved.

- Spin-offs and start-ups. When universities become involved in the creation of spin-off companies for the commercialization of research results developed within the university, a number of issues arise on which it is important to establish policies or guidelines. These may include, for example, whether the university, or its faculty, is entitled to own equity over a company; whether the university, or its faculty, can or should participate in the board of directors of a spin-off company; and whether, and in which conditions, researchers/professors are entitled to take leave to work in a spin-off company. In countries where university researchers are formally employees of a central research funding body or science and technology commission, which pays their salaries, such policies would have to be established at the national level.

3. INSTITUTIONAL SET-UP AND PRACTICAL ASPECTS FOR TECHNOLOGY TRANSFER FROM UNIVERSITIES TO INDUSTRY

- Establishment of technology transfer offices (TTOs). Technology transfer activities within universities are generally best served through the establishment of a dedicated office. In different countries or institutions technology transfer offices are known under different names and their tasks may be limited exclusively to IP management and technology transfer or their mandate may be broader thus including not just technology transfer but any interaction or contractual relation with the private sector. The advantage of having an office that is specialized in technology transfer is that it enables universities to professionalize their technology transfer activities. TTOs may be internal to the institution, attached to the university or faculty authorities, or responsibility for

technology transfer may be transferred to a separate agency, foundation or university-owned company.

- Joint technology transfer offices. The establishment of joint TTOs for groups of universities or PROs that are based in the same region or specialize in similar fields is an option that has been implemented by a number of institutions in developing and developed countries alike. One of the main reasons for establishing joint TTOs is that individual universities may not generate sufficient work to justify the creation of a specialized office with skilled human resources. Arguments in favor of such an approach, therefore, emphasize the importance of having a critical mass and the possibility of hiring highly skilled human resources at a lower cost for each individual institution. Nevertheless, it may also be argued that it is important that TTOs are within the university itself so as to have more direct interaction with the researchers and to avoid situations of institutional mistrust when the TTO is shared with other institutions.

- TTO requirements. The requirements for a TTO to function efficiently will depend significantly on each institution and the context in which it operates. As concerns funding, it is important to bear in mind that TTOs cannot become "money-makers" overnight, and funds will have to be allocated for its functioning for several years before it can begin to generate its own revenues and eventually contribute to the university's own income. Personnel requirements will also depend on the institution, the volume of work and the mandate of the TTO. It generally may range from an interdisciplinary team of people with legal, scientific and commercial expertise to a single individual that is capable of leveraging the necessary support from external experts. A crucial point for any TTO is to have the full support of university authorities.

- Developing simple and transparent procedures. The development of simple and transparent procedures for disclosing inventions and negotiating with external partners is important so as not to unnecessarily delay technology transfer activities and ensure that the TTO is perceived as an efficient support structure by researchers themselves. The existence of a standard invention disclosure form is essential to make it easy for inventors to disclose their inventions to the appropriate body. It is also useful for TTOs to develop model material transfer agreements and model confidential disclosure agreements which can then be adapted to specific circumstances. Many TTOs also accumulate over the years a database of licensing agreements which are used as the basis for drafting and negotiating new agreements and helps in speeding up processes.

- Patenting decisions. TTOs, or the relevant body in charge of evaluating invention disclosures, are ~~in charge of~~ responsible for taking decisions on what to patent, where to patent and when to patent. Most universities rely on external patent agents with specialized knowledge to draft patent applications if the relevant expertise does not exist in-house, even if this is likely to raise the costs. It is crucial that patents be properly drafted for them to be of any value to business. As concerns costs, it is important that universities (or research funding agencies) allocate funds for filing patent applications. Some TTOs rely on their private commercial partners to shoulder part or all of the patenting costs.

- Licensing practices. Licensing practices vary considerably between institutions and fields of technology. Many universities are keen to promote non-exclusive licenses and seek to ensure that any exclusive licenses that are granted will include clauses to protect against

failure by the licensee to carry out effective development and marketing of the invention. Thus, clauses requiring to work the invention within a given time frame or clauses stating minimum royalties to be paid regardless of whether the technology is commercialized or not are provisions sometimes used by universities to ensure that the goal of commercialization is met. An important point to be made is that a significant number of university-developed technologies are licensed as technical know-how without having been patented, and that universities often also license inventions for which a patent application has been filed but has not yet been granted.

- Marketing patented technology: TTOs are generally responsible for marketing university technology and searching for commercial partners. This is generally one of the most challenging tasks for TTOs. If commercial partners cannot be found and patented technology is not transferred to industry, patenting will only result in costs for the university. It is important, therefore, that TTOs take an active role in seeking targets for technology transfer and establish close relations with companies in the specific fields of expertise of the university. Experience has shown that a large number of successful licensing agreements result from contacts provided by the researchers/inventors themselves who are likely to know better than anybody else which companies might be interested in a given technology. As a result, many TTOs give researchers a lead role in identifying the appropriate partners for technology transfer.

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