

OPPORTUNITIES FOR DEVELOPING BIOTECHNOLOGY FORESIGHT STUDIES IN PARTNERSHIP WITH SOUTH AMERICAN INSTITUTIONS

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Abstract

The aim of this article is to outline opportunities for partnerships between OBTEC (Technology Observatory), a department at the National Institute of Industrial Property (INPI) in Brazil, and South American institutions with similar or complementary expertise, for joint biotechnology foresight studies. OBTEC aims to foster greater interaction between INPI and other agents from the Brazilian innovation system by producing knowledge on different sectors of the economy to provide information for public policymaking. Institutions from Argentina, Chile and Colombia were selected as potential partners in the development of biotechnology foresight studies based on information contained in patent documents. The expected results/benefits are: to expand the scope of OBTEC's activities through partnerships with foreign institutions, in line with a worldwide trend; to generate strategic information about biotechnology in South American countries in which Brazil has commercial, political and/or geostrategic interests; and to produce biotechnology knowledge to support public policymaking in this area.

KEYWORDS: biotechnology, foresight studies, innovation, intellectual property, patent, public policy.

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1. Introduction

In the last ten years, technological innovation has become increasingly central to the social and economic development of countries in a globalized world, since it enables resources to be optimized, production structures to be changed and growth to be accelerated. The Brazilian government has recognized the strategic importance of intellectual property (IP) to the Brazilian innovation system in several ways, including “Plano Brasil Maior”, a plan which sets forth the Dilma Rousseff administration’s policy for industry, technology and foreign trade. The focus of the plan is on fostering innovation and boosting the nation’s industrial output. The government intends to engage in the construction of joint projects and programs between the public and private sectors, namely: i) **to strengthen** the plastics, footwear and leatherware, textile and garments, furniture, toys, personal hygiene, perfumery and cosmetics **production chains** and production support services; ii) **to expand and build new technological and business**

competencies by providing incentives for activities and businesses with the potential to penetrate dynamic markets and to boost the purchasing power of the public sector to create and scale-up knowledge-intensive businesses. In this area, the target sectors are: capital goods, information and communication technology, chemicals and petrochemicals, aerospace, defense and health; iii) **to develop energy supply chains** (oil & gas, bioethanol and renewable energies) so that Brazil can become one of the world's largest suppliers; iv) **to diversify exports (markets and products) and internationalize business activities** in the health, technology, information, communication and defense sectors; v) **to expand** the scientific and technological content of natural resource-intensive sectors, enabling Brazil to harness its advantages in the production of commodities to further differentiate its output (PLANO BRASIL MAIOR, 2011).

In this context, the National Institute of Industrial Property (INPI) has become increasingly important as the institution responsible for the production and dissemination of knowledge on industrial property¹, taking on a strategic role of particular importance to the Brazilian innovation system. It also coordinates assistance for the agents involved in this system so that they can harness industrial property not just to protect the creations of human intellect but primarily as a means of capacity building and boosting competitiveness.

INPI's workforce has grown significantly in the last six years, and on November 12, 2010, it was formally restructured. A number of new departments and areas were created, including the Technology Observatory (OBTEC), which is part of the Cooperation for Development Area.

OBTEC's main mission is to build an environment for direct interaction between INPI and the different agents from the Brazilian innovation system by producing knowledge about the particularities of different sectors of the economy to serve as inputs for public policymaking. This

¹ It aims to boost creativity by protecting, disseminating and applying its results. The instruments it uses for this are the granting of patents, registration of industrial designs, trademarks, computer programs, geographical indications, integrated circuit topographies, and technology transfer agreements, as well as curbing unfair competition.

knowledge production process takes the form of **foresight², monitoring³ and mapping⁴ studies into national and international technology developments**, based on industrial property documents and other sources of technological information. The idea is that OBTEC conduct joint studies with INPI partner institutions that focus on the country's technological, social and economic needs.

Today, institutions are attracted to do collaborative work with OBTEC primarily through legal instruments which formalize the relationship between entities with a similar remit to INPI or which conduct research and development in the field of intellectual property. It is worth mentioning that the management of the portfolio of INPI partner projects (both domestic and foreign) and the roles of planning, implementation and execution are the responsibility of two departments at INPI, the National Cooperation Department and the General International Cooperation Department, both of which report to the Cooperation for Development Area. OBTEC also counts on partnerships inside INPI to attain its goals, namely: the aforementioned national and international cooperation departments, the Academy of Intellectual Property, Innovation and Development and the Center of Dissemination of Technological Information (both also under the aforementioned Cooperation for Development Area), as well as the different technical areas inside INPI, especially patents and trademarks.

In the international arena, INPI has become increasingly active in disseminating information and knowledge about IP to countries with less expertise in the area. In order to enhance the quality of its services and take part more actively in international discussions on the topic, INPI has worked in collaboration with its peers in other countries, with education and

² A systematic method for mapping future S&T developments by projecting trends capable of significantly influencing an industry, economy or society as a whole.

³ A process whereby the development of a given technology, sector or industry is monitored continuously in order to produce information to support decision-making processes.

⁴ A sector-wide approach to identify technology bottlenecks, conversion problems in certain processes, and opportunities for technology development and improvement.

research institutions involved in IP, and with multilateral entities from different countries. It now has 41 cooperation projects underway with countries from different continents, especially South America and Africa, which is in alignment with Brazil's foreign policy of forging closer ties between the two continents.

One important international partner for INPI is the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations in the area of IP which is dedicated to developing an accessible international IP system, which rewards creativity, stimulates innovation and contributes to economic development, safeguarding the public interest. (WIPO, 2012).

Thanks to this partnership, INPI has over its four decades of existence benefited from countless technical assistance initiatives offered by WIPO with a view to spreading an IP culture to less developed countries.

As part of its relationship with relatively less developed countries, the Brazilian government has also offered support for other developing countries since the mid-1970's in the form of technical cooperation agreements. Recently, Brazil has stepped up its actions of this nature in a bid to transform its role from recipient of assistance to provider of cooperation.

2. Motivation

Science, technology and innovation (ST&I) observatories have the function of observing and monitoring the development of different areas of knowledge, focusing on their critical aspects (bottlenecks) and addressing specific countries, regions or agents within a particular time frame or periodically. Observatories may also produce science-, technology- and innovation-related indicators which enable future trends to be identified. Above all, the idea behind creating these observatories is to drive decision- and policymaking processes in information-intensive public and private sectors (NASCIMENTO, 2007).

International experience in the creation of science and technology (S&T) observatories has taken great strides in integrating and orchestrating efforts to disseminate the strategic use of technology-related information, yielding very positive results for innovation systems. The first observatories were created more than 15 years ago. Some are linked to their host countries' IP entities while others are not. It is these entities that have served as a template for similar experiments in other countries. One of the key factors behind their success has been their option to **work in networks** with other entities with similar competencies, forming groups of actors and specialists with diverse, complementary skills in different countries (GUSMÃO, 2005).

In Brazil it cannot be said that there is a single, centralizing model at the present time that embraces all the functions expected of a S&T observatory. The reasons for this are multiple. First, the observatory structure is not in essence a classic, exclusive attribute of the state. Secondly, it is understood that these functions could be undertaken by federal or public institutions (run by different federal entities) or indeed by the private sector, which reflects the capitalist thinking that has shaped today's international trade scenario, dependent as it is on the initiative and competitive capacity of private enterprise.

In this context, the factors that motivated this study were: (a) S&T observatories are normally an agglomeration of institutions of different, complementary natures and areas of expertise; (b) thus far all OBTEC's projects have been restricted to partnerships with Brazilian institutions; (c) the OBTEC technical team is currently made up of professionals with expertise in the biotechnology sector; (d) INPI's General International Cooperation Department was set up to seek out potential **international partners** for joint projects with OBTEC, as set forth above.

3. Objective and Justification

The aim of this study is to **identify** the opportunities that exist for INPI/OBTEC to undertake biotechnology foresight studies, monitoring and/or mapping in partnership with

institutions from countries in South America with similar or complementary expertise. The aim of such studies should be to support national public policymaking and to produce knowledge on certain sectors of the economies of countries in the continent in which Brazil has commercial, political and/or geostrategic interests.

In order to attain the proposed goal, this study will have the following intermediate objectives: a) to list and describe all the valid inter-institutional partnership agreements between INPI and countries from South America; b) to select the most promising partners, identifying which institutions have expertise that is similar to or complements that of OBTEC; c) to describe the profile of the potential partner institutions; and d) to make suggestions of joint projects between OBTEC and these potential partner institutions.

Biotechnology was chosen as the target area for potential joint technology foresight, monitoring and mapping projects between INPI/OBTEC and institutions from other South American countries with skills of a complementary or similar nature, because:

(a) biotechnology is one of the priority sectors in the government's strategic plan for industry, technology and foreign trade (Plano Brasil Maior);

(b) the joint projects currently being conducted by OBTEC with Brazilian institutions – such as the Oswaldo Cruz Foundation (Fiocruz), EMBRAPA (Brazilian government agency promoting agricultural R&D), the Institute of Applied Economic Research (IPEA), and FINEP (ST&I funding agency) – all involve biotechnology;

(c) OBTEC's technical staff are mostly from the biotechnology sector; and

(d) work in the field of biotechnology is conducted by institutions from other South American countries with similar or complementary expertise to INPI/OBTEC.

In the mid and long term, three other observatories are envisaged under the Technology Observatory (OBTEC) department to focus on the **energy**, **health** and **defense** sectors, which are also priority areas for Brazil, as set forth in the “Plano Brasil Maior” strategic plan.

4. Development

4.1 Technology Observatory (OBTEC)

INPI’s new internal structure, formalized in decree 7.356 on November 12, 2010, created a new department called the Technology Observatory, or OBTEC. The primary mission of OBTEC, as explained above, is to produce knowledge from information contained in industrial property documents in order to help guide public policymaking. The knowledge production process will be consolidated through national and international **technology foresight, monitoring and mapping studies**, incorporating forward-looking analyses. Performed in collaboration with partner institutions, these studies are based on industrial property documents (patents, trademarks, industrial designs, technology transfer agreements, geographical indications, etc.) as well as other kinds of technological information. OBTEC intends for the synergetic partnerships with other institutions of a similar nature or with complementary skillsets to enhance the technical and strategic capacity of all those involved and for their results to be divulged in joint publications.

The strategic information that could be produced in collaborations of this nature includes identifying:

- research and development centers in key areas of technology;
- research, development and innovation networks that exist between countries;
- the state of evolution and maturity of technologies;
- groups interested in selling technological inventions in different countries;

- experts in given markets;
- technological hubs in different parts of the world (tracking technological capacity);
- technologies that could be exploited in Brazil;
- new markets and emerging technologies;
- potential technology pathways to improve existing products and processes;
- sources of licensing.

4.1.1 Selection of OBTEC Partner Institutions

Institutions could partner with OBTEC in foresight, monitoring and/or mapping studies of different sectors by different means:

a) through the technical cooperation agreements⁵ between INPI and other institutions⁶ in Brazil. In this case, the agreements are managed by the National Cooperation Department. At the present time, most of OBTEC's work is being conducted in partnership with institutions with which INPI has technical cooperation agreements. However, as the primary focus of OBTEC's work is to support public policymaking, the INPI partner institutions involved in such work must in the main have no private interests;

⁵ Instruments of this nature enable the conciliation of institutional goals and interests through collaborations in which their institutional competencies, objectives and efforts are pooled to their mutual benefit. Such agreements define the roles and responsibilities of the parties involved in the execution of the activities, for which they are subsequently held accountable.

⁶ Institutions may be business associations, trade associations, funding agencies, federations of industries, universities, and any other public or private entities involved in technology research and development and business innovation.

b) through external demands made to the Academy of Intellectual Property, Innovation and Development⁷ and/or the Center of Dissemination of Technological Information⁸, both under the Cooperation for Development Area in INPI;

c) through cooperation agreements between INPI and foreign institutions through the mediation of the General International Cooperation Department. The kinds of institutions and partnerships will be described below.

4.1.2 Flow Chart of Operations

Bizagi 10⁹ open source software was used to create a flow chart (Figure 4.1) of the stages involved in the production of knowledge and the proposed guidelines for public policymaking, based on the studies (technology foresight and/or monitoring and/or mapping) undertaken by OBTEC in partnership with other institutions. This flow chart only applies to cases where the collaborative work is formalized in a technical cooperation agreement with the participating institution, which is the method by which OBTEC now structures its partnerships.

Figure 4.1

4.2 Bilateral Cooperation Instruments Between INPI and Countries from South America

The General International Cooperation Department was formed with the main goal of maintaining and improving mechanisms to foster greater Brazilian participation in IP protection systems and of disseminating INPI's mission in Brazil by setting up collaborations with equivalent entities abroad or international organisms working in IP.

⁷ Created in 2010, the INPI Academy mainly engages in capacity building and training in the field of IP for agents of the Brazilian innovation system, while also coordinating the master's program in IP and innovation and the recently approved doctoral program in the same area.

⁸ Meanwhile, one of the attributes of the Center of Dissemination of Technological Information is to draft publications based primarily on information extracted from patent documents. These publications may be commissioned by any interested party and their cost is set in the INPI table of fees. An initial fee of R\$ 95.00 is paid, and the total cost is calculated at the rate of R\$ 50.00 per person-hour. Further details at http://www.inpi.gov.br/images/stories/Tabela_Retribuicao_2012_CEDIN.pdf.

⁹ <http://www.bizagi.com>.

Today, INPI has bilateral cooperation agreements with Uruguay, Bolivia, Chile, Paraguay, Peru, Colombia and Argentina.

There are also two special cooperation instruments for the region. The first, a four-party agreement, is between Argentina, Paraguay, Uruguay and Brazil, and the second is for the institution of PROSUR, a regional IP system.

A one-off technical cooperation agreement has also been created in the form of an executive program with WIPO which focuses on cooperation between developing countries, or south-south cooperation.

All the abovementioned agreements will be detailed below.

4.2.1 Uruguay

The nature of Brazilian cooperation with Uruguay is unusual because it is formalized at a higher hierarchical level: an industrial property, technological information and technology transfer cooperation agreement between the Brazilian and Uruguayan governments. The agreement between INPI and its Uruguay counterpart, Centro Nacional de la Propiedad Industrial (now Dirección Nacional de la Propiedad Industrial) aims to foster: a) exchange of technical staff; b) capacity building and training programs; c) exchange of information and documentation; d) provision of technical assistance; and e) holding of conferences and seminars.

Brazil and Uruguay maintain active dialogue about the region's industrial property system. However, fewer bilateral cooperation initiatives of a practical nature have been taken than would be desirable because of the countries' respective domestic agendas.

4.2.2 Bolivia

In 2000, INPI and Servicio Nacional de Propiedad Intelectual (the Bolivian IP service) signed a memorandum of understanding concerning cooperation in the area of industrial property. However, despite the existence of this communication channel between the two entities, little in

the way of concrete cooperation initiatives has been achieved in the last decade because of their respective internal priorities.

4.2.3. Chile

Since 2010, INPI has had a memorandum of understanding for bilateral cooperation with its counterpart in Chile, INAPI. The idea is to enable a variety of joint activities, including exchange of experiences, information, knowledge and skills. These could include training and capacity building for their technical staff in the role of their administrative entities and how to improve their services as a whole. The MoU has a very broad scope which has the potential to be exploited by INPI.

4.2.4 Paraguay

The agreement signed between Brazil and Paraguay on July 2, 1982, has as its direct executive entities INPI and its Paraguayan counterpart, Dirección General de Propiedad Intelectual (DGPInt).

One of the chief elements of this agreement establishes that Paraguay “may make use of the services of the INPI patent database (run by the Center of Dissemination of Technological Information) in accordance with rules to be agreed upon by the parties.” In fact, for 30 years Brazil has been very important in cementing this relationship through prior art searches for patent applications in Paraguay.

4.2.5 Peru

INPI and its Peruvian counterpart, INDECOPI, have for the last decade conducted a number of joint activities ranging from the training of examiners to technical missions. INDECOPI differs in some quite significant ways from the Brazilian agency, which is what makes it so important. Cooperation between the two parties is very active in virtue of the potential advantages to be gleaned on both sides.

4.2.6 Colombia

Brazil and Colombia have relatively close ties in this area, and in the last decade institutional interaction in the field of IP has evolved and expanded. For instance, INPI cooperates with two Colombian institutions: Superintendencia de Industria y Comercio (SIC), an entity under the auspices of the Colombian Ministry of Trade, Industry and Tourism, and Colciencias, a public institution working in ST&I.

In July 2012 INPI and SIC signed an agreement formalizing their technical and political cooperation. The document is framed in relatively simple terms. However, closer ties were forged between both parties when Colombia and Brazil, through the Brazilian Cooperation Agency, formally established a project entitled “Cooperation for the Strengthening of the Industrial Property Protection System and Process in Colombia” in January 2010, valid for 18 months. The main aim is to train Colombian specialists in the management of protection mechanisms for the intangible assets of industrial property.

One of the main goals is to “prepare the profile of a Colombian-Brazilian cooperation program about protection and management in the area of industrial property, which will be based on both countries’ experience in these areas.” Finally, one of the topics identified is technology intelligence in areas of mutual interest. This last aspect is particularly important as it is within the scope of the Colombian demands, making it of particular importance to the present study.

4.2.7. Argentina

For many years Brazil and Argentina have maintained dialogue and collaborated in joint activities in South America. To a certain extent, this is because for many decades both countries have been the dominant players in the continent.

More recently, collaborative activities with Argentina have been pursued under PROSUR, whose leadership both countries have shared, as well as in bilateral projects. This can be seen, for

instance, in a bilateral MoU signed in 2012 for the development of operational tools of significance to PROSUR.

4.2.8 PROSUR

The constitution of PROSUR, a regional IP system, is associated with the regionalization of discussions concerning industrial property in the continent. This is because since the 1970's and 80's there has been increasing debate in the main international forums, like the United Nations Conference on Trade and Development, about the role of technology transfer in the development of nations.

In the last decade in particular, a group of industrial property offices in South America started to engage in dialogue and liaison with a view to cementing operational cooperation, which was in line with the Brazilian foreign policy guidelines of the Luis Inácio Lula da Silva administration (2003-2010). This culminated in the mutual interest in forming PROSUR.

Although it is not yet legally constituted, cooperation activities already exist and PROSUR already encompasses nine national entities working in the processing of industrial property applications, from Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Suriname and Uruguay. Their main objects include the potential to develop tools and methods for joint activities on an operational level. In other words, the parties involved do not intend to make any legislative changes, but merely to mature their administrative practices.

4.2.9 WIPO

Cooperation with the World Intellectual Property Organization (WIPO) is particularly important for INPI as it is a United National agency that specializes in IP and has great expertise in discussions on this matter.

INPI has counted on the partnership of WIPO since it was established, when its employees – especially its patent and trademark examiners – required specialized training. In 1997, under

the supervision of the Brazilian Cooperation Agency, the technical cooperation projects involving WIPO entered a new phase with the creation of a project for the restructuring of INPI, both physically and operationally, which was concluded in 2005. In 2006 a new project was introduced for the capacity building of its technical staff and the dissemination of an IP culture.

4.3 Potential OBTEC partner institutions in South America

In view of the technical cooperation agreements signed between INPI and countries from South America, the countries with the greatest potential for partnerships with INPI were selected as priorities for this study: Argentina, Chile, Colombia, Paraguay and Peru. Next, institutions with similar or complementary expertise to OBTEC or with a profile that would make them suitable candidates for a ST&I observatory were identified. No institutions with such a profile were identified in Paraguay or Peru.

As proposed in item 3 of this paper, the profiles of the institutions from the selected countries (Argentina, Chile and Colombia) with the potential to partner with OBTEC in the development of biotechnology foresight, monitoring and mapping will be described.

It is worth mentioning that as the institutional contacts made by INPI are with other industrial property offices – its peers in other countries – they have the potential to act as direct or indirect interlocutors with the observatories envisaged by INPI. Furthermore, the coordination and exchange activities themselves could trigger, in the offices in question, the need to create an internal structure akin to that of a technology observatory.

4.3.1 Argentina

Argentina has one institution that could potentially partner with OBTEC: **Observatorio de Prospectiva Científica y Tecnológica (OPCyT)**. Of all the institutions selected, OPCyT seems to be the one that most closely resembles OBTEC. Its main focus is on preparing scenarios which give a broader perception of future developments and support decision-taking in the present to

channel efforts towards more favorable future scenarios. More specifically, OPCyT divulges technologies available in Argentina and other countries so that they can be transferred or adopted by the domestic production sector. As already mentioned, one of the potential focus areas of OBTEC's work is to identify biotechnologies that could be exploited in Brazil, either because they are not protected by patents or because their patents have expired¹⁰.

4.3.2 Chile

One potential partner was identified in Chile: **Observatorio Chileno de Ciencia, Tecnología e Innovación (KAWAX)**. Under the auspices of the Chilean government's National Commission for Scientific and Technological Research (Comisión Nacional de Investigación Científica y Tecnológica, CONICYT), KAWAX was formed with the aim of producing information, indicators and studies about national research, development and innovation activities in order to assist the decision-making of the actors involved in the national innovation system. Furthermore, KAWAX coordinates cooperation between ministries, governments, business, universities and NGO's. Its activities are published in two channels: *Atlas de la Ciencia de Chile* and the COLLEXIS databases, which contain bibliographical information from different areas of knowledge. There is a good deal of similarity between the respective profiles of KAWAX and OBTEC.

4.3.3 Colombia

The only potential partner for OBTEC identified in Colombia was **Observatorio Colombiano de Ciencia y Tecnología (OCyT)**. Located in Bogota, its main objects are: to investigate the state-of-the-art and dynamics existing between ST&I; to produce and transfer S&T indicators to the actors in the national S&T system, giving them assistance in decision-making processes; and to identify trends in emerging technological sectors, amongst others.

¹⁰ Patents can expire when the assignee stops paying the patent maintenance fees either because of lack of interest or for some other strategic reason.

OCyT publishes indicators on S&T capabilities and technological innovation indicators in Colombia in the areas of biotechnology, S&T and patents, and comparisons of technological innovations in Argentina, Chile, Colombia and Venezuela.

There is a decided similarity between the goals of this institution and the goals of OBTEC, particularly the fact that OCyT also has expertise in patents and has **biotechnology** as one of the key areas of its technology analyses.

4.4 Opportunities for Collaborative Work Between OBTEC and the Institutions Identified in South America

Table 4.1 below sums up the areas in which each of the institutions selected as possible OBTEC partners in South American countries work.

Table 4.1

Before outlining the potential ways in which OBTEC and the selected institutions could work together, it is important to note that initially, because the team of researchers at OBTEC is so small and because their expertise is in one particular area, OBTEC's technical contribution would have to be restricted to biotechnology patents as a source of technological information for future technology foresight, monitoring and/or mapping. As such, should the partner institution have complementary competencies, these should be exploited in the joint work.

At a later stage, both parties having already acquired experience through the partnership and OBTEC's technical team having expanded and become more multifaceted, its contribution to the collaborative efforts could branch out to other technological sectors and draw on knowledge from other areas of industrial property (industrial designs, trademarks, technology transfer contracts, computer programs, geographical indications, integrated circuit topographies, etc.).

From observing the main competencies of the three institutions selected as potential partners for OBTEC (Table 4.1) one can conclude that they all have very similar expertise,

focusing on foresight, monitoring and the development of indicators. In view of the OBTEC technical team's expertise today, the biggest benefit for INPI would be to learn from its partners how to develop indicators using information contained in patent documents from the biotechnology sector.

From the perspective of the partner institutions, with the exception of OCyT, which already has experience in patents, the other two could incorporate the use of patents as a strategic source of technological information into their foresight and monitoring studies, harnessing INPI's expertise in accessing, retrieving, processing and analyzing data of this kind.

Observing each institution individually, it's possible to conclude that most of OPCyT's work is in foresight, although some focuses on innovation. It would be of great value to OBTEC to know and understand the sources of information used in these foresight studies, especially the ones that seek to study biotechnology innovation. When patents are used for this kind of research, what is being assessed is far closer to R&D than innovation per se. In other words, the kinds of analyses made by OBTEC and OPCyT are of a complementary nature, and therein lies the potential for synergy between the two agencies.

Turning to KAWAX, most of its work is not thematic, with the exception of two cases that address the IT sector and global opportunities in the fishing industry. It has great expertise in S&T analysis and some of its studies are geared towards identifying gaps between R&D and innovation. This latter area could be the topic for an initial collaborative project with OBTEC, in view of the fact that Brazil lacks studies of this nature and much of what is developed at the country's universities never makes it to the market precisely because of the gap between the academic world, led by public institutions, and the market, led by private enterprise.

One of the works published by OCyT deserves particular attention: "Construcción de indicadores en biotecnología" ("Development of Biotechnology Indicators"). This is a clear area

of opportunity for joint work with OBTEC, in which INPI could contribute with its acquired knowledge in foresight using biotechnology patents while learning the methods involved in developing indicators. The key here is that biotechnology is a topic of interest to both institutions. More specifically, given that Colombia also boasts great biological diversity and is consequently keen to appropriate its natural resources and traditional wisdom, a collaborative foresight study could be conducted that addressed access to both countries' biodiversity, as well as how to protect it and the impacts on R&D and the economies of both countries. INPI has a wealth of experience in this area, having taken part actively in national and international discussions on the topic. Also, OBTEC has partnered with Fiocruz with the aim of producing knowledge on the current impacts of Brazilian legislation on access to genetic resources and related traditional knowledge on R&D and innovation in the Brazilian market.

Finally, there is one more potential opportunity for partnerships with the selected institutions: given that none of them participates in a network with other entities, it is possible that OBTEC could, in the long term, after concluding the first joint studies, form a multi-disciplinary network with these institutions, which would be in line with global trends in ST&I observatories.

4.5 Benefits of the Project and Challenges

The implementation of the projects described in this work could yield many **benefits** for INPI, most of which have been highlighted throughout this paper.

In the short term: i) partnering with foreign institutions should help consolidate the work of OBTEC, a recently formed department at INPI; ii) the OBTEC technical team should acquire greater expertise through an exchange of experience with professionals from partner institutions. Given that the three institutions selected as potential partners have knowledge in the development of ST&I indicators, it is hoped that OBTEC may acquire similar skills, because historically INPI

has never included the development of indicators based on industrial property documents in its studies; iii) OBTEC's range of action should grow, because today it only partners with Brazilian institutions; iv) should it meet the proposed goals, OBTEC should be capable of building knowledge about different economic sectors in different South American countries in which Brazil has commercial, political and/or geostrategic interests.

In the mid term, working with partner institutions in South America is expected to strengthen INPI's role in the dissemination of industrial property knowledge in the region.

More ambitiously, in the long term OBTEC could form a multidisciplinary network with other institutions in South America, not just the ones selected in this work, following the lead of other ST&I observatories around the world. Nonetheless, it is unlikely that a competitive intelligence network in South America, of which OBTEC would be a member, would take shape in the same way as in developed countries, where innovation systems are better structured and have quite different features from those seen in developing countries, particularly when it comes to coordination between the public sector, the production sector and the S&T community.

5. Final Remarks and Conclusions

Science, technology and innovation are increasingly important in knowledge-based economies. This is why it is so important and strategic to incorporate technology trends into public and private policymaking and decision-making processes.

In Brazil, technology foresight studies are not conducted with any great frequency. Only in recent years, with the expansion of the Brazilian economy and heightened foreign interest in the Brazilian market, have Brazilian businesses and government entities started to show interest in tools of this kind. A few projects to set up competitive intelligence teams inside businesses and public institutions are now starting to be seen, albeit sporadically.

Concomitantly, the Brazilian government is starting to recognize the strategic importance of IP for the Brazilian innovation system. This has empowered INPI as the institution responsible for producing and disseminating IP knowledge, giving it a strategic role of particular significance in this system.

Based on a detailed analysis of all the partnership agreements between INPI and institutions from other South American countries, certain opportunities for OBTEC to harness these channels to conduct foresight studies in partnership with its peers in three countries were identified: Observatorio de Prospectiva Científica y Tecnológica (OPCyT), in Argentina, Observatorio Chileno de Ciencia, Tecnología e Innovación (KAWAX) in Chile, and Observatorio Colombiano de Ciencia y Tecnología (OCyT) in Colombia. All these institutions have similar skillsets, focusing on foresight, monitoring and indicator development.

By analyzing the works published by the three institutions selected, it was possible to envisage what kinds of studies could be conducted in partnership, all of which would initially focus on biotechnology.

With the exception of OCyT, which has experience in patents, the other two entities could incorporate the use of industrial property documents (industrial designs, trademarks, technology transfer contracts, computer programs, geographical indications, integrated circuit topographies, etc.) into their foresight and monitoring studies as strategic sources of technological information. In so doing, they could draw on INPI's expertise in accessing, retrieving, processing and analyzing data of this kind.

Joint studies with OPCyT could lend OBTEC knowledge about the methods used in innovation studies, which is an area of expertise demonstrated in publications by OPCyT. As for KAWAX, there is an opportunity for OBTEC to learn with this institution in the joint development of foresight studies involving S&T analyses and bridging the gaps between R&D

and innovation, which are competencies demonstrated in KAWAX publications.

The partnership with the greatest potential would be with OCyT, which could facilitate the exchange of OBTEC's experience in the preparation of foresight studies using patents (and other industrial property documents), and methods for developing indicators, in which OCyT has expertise. Given the Colombian institution's proven interest in biotechnology, having conducted studies in the area involving innovation indicators, and in view of the fact that Colombia boasts great biodiversity and is concerned about access to its genetic resources, a collaborative foresight study could be conducted that addressed access to both countries' biodiversity, as well as how to protect it and the impacts on R&D and the economies of both countries.

One long-term opportunity identified for all three peer institutions in South America is that OBTEC could spearhead the formation of a multi-disciplinary network with these institutions, following the lead of other ST&I observatories around the world.

At first sight, cooperation between developing countries might seem to bring little in the way of effective gains for the parties involved. However, this superficial view fails to take account of the opportunities that exist above and beyond mere economic gains, which could even reach a geostrategic level. Bargaining power is more often than not in the hands of more technologically advanced nations, which might induce the thinking that only where some incentive was on offer would a party be willing to make concessions in exchange for immediate gain. This mindset needs to be turned on its head, as relatively less developed countries often make concessions in exchange for immediate gains, but rarely take a mid- or long-term view.

The cooperation models envisaged present real opportunities on both sides. Initially, INPI would be responsible for technology foresight, monitoring and mapping in the area of biotechnology, which could help the partner countries in their public policymaking. In exchange they could gather strategic information about the biotechnology developed in these countries and

identify biotechnology niches in which Brazil has a comparative advantage. However, Brazil's role in its partnerships with these countries should not be understood as expressing zero-sum thinking, where one side stands to win and the other to lose. Closer proximity between the continent's nations is in keeping with a historically constructed rationale which understands that the countries of Latin America should join forces to garner greater advantage by harnessing the opportunities and benefits inherent to their socioeconomic, historical and geographical similarities. Indeed, Brazil, Argentina, Chile and Colombia have structural similarities which result in a scarcity of resources for effective action in the sphere of domestic public policies.

With this project, it is hoped that OBTEC will consolidate and expand its work, gaining new international partners for the development of foresight studies; that its technical staff's competencies will be built through the exchange of experience with partner institutions; and that OBTEC is able to acquire knowledge on the sectors of the economies of the countries in South America in which Brazil has commercial, political and/or geostrategic interests.

In the mid term it is hoped that OBTEC will consolidate its importance to the Brazilian innovation system as a producer of strategic information for all those involved in decision-making processes involving ST&I in the country. OBTEC will also help strengthen INPI's capacity to disseminate IP knowledge to South America and Latin America as a whole. Likewise, the partnership between OBTEC and the General International Cooperation Department in INPI is essential for guiding and consolidating OBTEC in its present and future roles.

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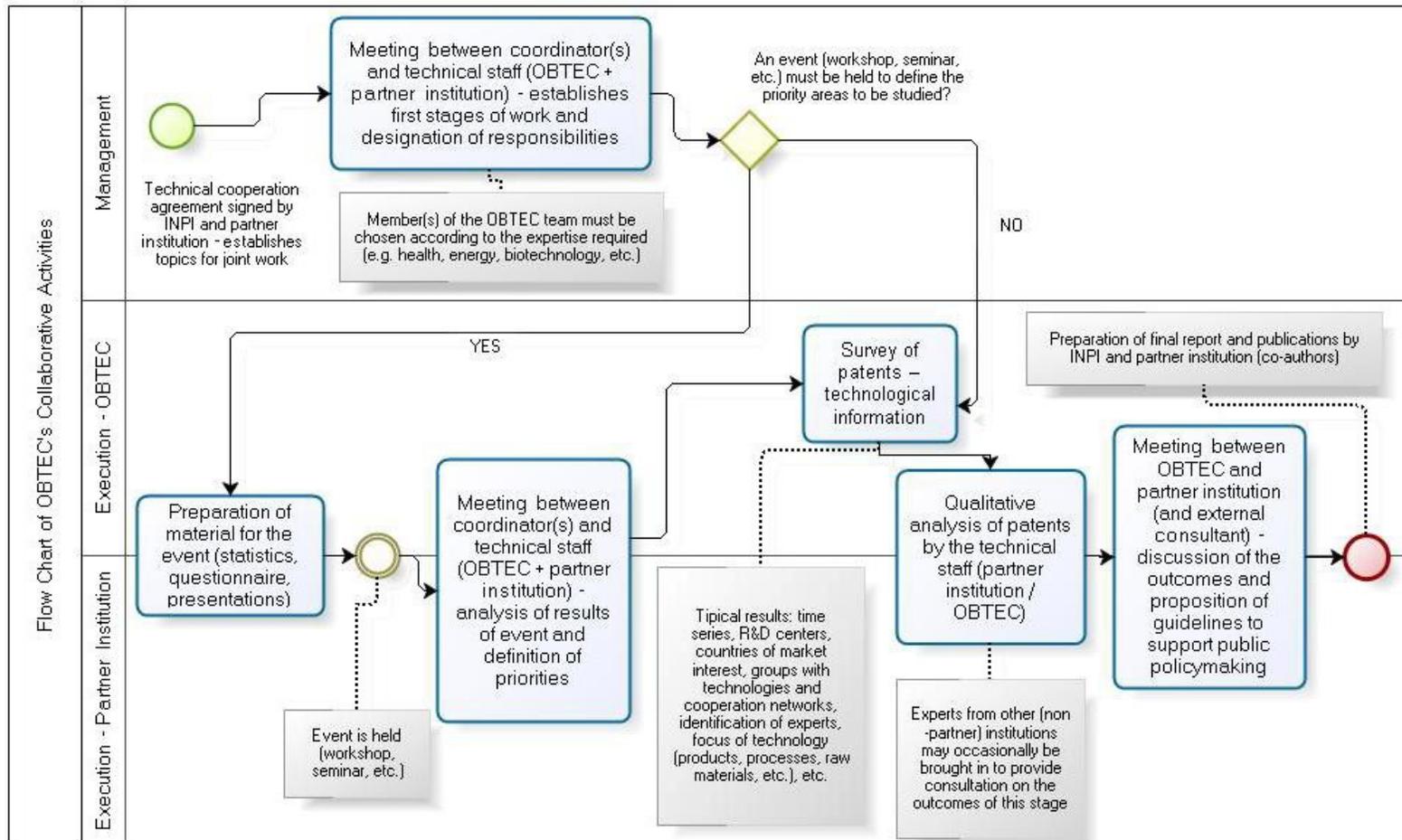


Figure 4.1- Flow Chart of Joint Work Undertaken by OBTEC and Partner Institutions

Source: Prepared by the authors using data from a talk entitled “INPI Technology Observatory – OBTEC – Experiences and Opportunities” given in August 2012.

Table 4.2 – Activities Undertaken by the Selected Institutions in South America

Institution	Country	Scenarios	Indicators	Foresight / Monitoring
OPCyT	Argentina			
KAWAX	Chile			
OCyT	Colombia			

Source: prepared by the authors