INNOVATION PROCESS AND INTERNATIONAL NETWORKS IN THE BRAZILIAN BIOSCIENCE INDUSTRY

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1 Introduction

The international bioscience sector is characterised by both high innovative potential and strong technological content. According to the Organisation for Economic Co-Operation and Development (OCDE, 2009), the world's bio-economy involves hundreds of billions dollars yearly. For example, the American biotechnology industry's revenues increased significantly, from 20 billion dollars in 1996 to 70.1 billion dollars in 2008, whereas research and development expenses increased from 10.8 billion to 30.4 billion dollars in the same period of time. It is also worth mentioning the growth in the number of biotechnology companies in the USA, which increased from 1,308 in 1996 to 1,754 companies in 2008 (LAZONICK & TULUM , 2011).

The importance of Brazil In this sector should also be emphasised because of its vast biodiversity, which is a source of new molecules in addition to being internationally recognised for its research capacity (CEBRAP, 2011).

The literature has shown some trends for the sector, and these have been the target of several studies (SWODA ET AL., 2011; PHENE & TALLMAN, 2011; CHESBROUGH, 2012; TÁLAMO 2008), such as: development in network, selection of partners, alliance management, operationalizing partnerships, and open business models. These studies show the importance of developing technological partnerships by means of networks on a worldwide basis.

Due to the characteristics of the sector, one can find several cases of partnership for improvement of the global competitiveness by means of innovation in its broader form, including development of new products, new business formats, and new organisational mechanisms. An example is the company Eli Lilly, who established a joint venture with the Indian pharmaceutical company Jubilant Organosys for development of new molecules. Another example is the case of a Swedish pharmaceutical company Orphan Biovitrum, who collaborated with the Chinese

company called Dongbao Pharmaceuticals in terms of production and marketing without involving any capital (PHENE & TALLMAN, 2011).

Therefore, the present study is aimed at answering the following question: which are the main factors for a successful process of development of innovations by the bioscience companies in Brazil? Secondary questions are also addressed: Are innovations made by means of partnerships on a worldwide basis? How are partners sought and selected? Do the companies present new business formats? How these partnerships are operated?

Therefore, this study will hopefully contribute to the development of the literature on the areas of network development as well as international business and organisational innovation, since most of the bio-science companies make innovations not only in their processes of development of new technologies, but also in their business model, production process, marketing or distribution format. This study will also allow such a theme to be more deeply understood, thus helping these companies' managers as well as the government to formulate public policies.

2 Theoretical References

In a highly competitive scenario, the interaction between partners has become fundamental and it is necessary to think of business on a global basis and develop R&D activities worldwide (DUNNING, 1994 & REDDY, 1997).

According to the literature, one can observe that the biotechnological sector is characterised by high costs with R&D as well as by a long and complex process for development and approval of a new product, with an estimation of 10 to 20 years for a product to become commercially viable and at a high probability of failure. For Lazonick & Tulum (2011), in 2005, the mean cost to develop one biological and pharmaceutical product was estimated at 1.24 and 1.32 billion dollars, respectively.

Therefore, bioscience companies often opt to develop new products by making alliances in order to minimise these risks. Additionally, this sector also has a multidisciplinary nature and consequently the partnerships become fundamental.

In a Canadian study on networks of biotechnology companies, Bliemel & McCarthy (2008) addressed how they related with key players such as consumers, suppliers and distributors by using geographical relations as an indicator of power relations.

The above-mentioned authors emphasised that biotechnology companies have two requirements to survive and grow: money and talent. Due to the high costs involved in drug development, the companies seek for public resources in the beginning of their lifecycle as they usually keep a relationship with universities in order to find talents. However, the authors point out that such a proximity, despite benefiting these relationships, would not be necessary.

The results of their study show that biotechnology companies actually keep a frequent relationship with universities, thus allowing transfer of knowledge following the spin-off process. These companies operate globally and their consumers are located worldwide, including North America. With regard to the suppliers, they are also located in North America and rest of the world, but because these companies are based on knowledge, they trade their patents so that no supplier will be needed.

The same study concludes that a proper relationship structure for biotechnology companies depends on their business model. Biotechnology companies tend to have a more global perspective, whereas the CROs (contract research organisations) are focused on keeping a close relation with local consumers and are aware of local competitors. The authors point out that the companies operating locally showed a modest growth compared to the better performance achieved by those operating in network.

The study of partnerships for development of global-scale innovation can be based on some already established concepts. One is the paradigm of open innovation. According to Chesbrough (2006), projects can be inserted into the process of innovation at any time as well as other projects can also be removed from the R&D internal process to be incorporated by other organisations which may or may not have initiated the process. New external technologies can also be internalised throughout the different stages of the innovative process.

Dahlander & Gann (2010) carried out a meta-analysis study on open innovation, in the papers published in the major periodicals on the innovation management area by proposing the following question: “How does openness influence firm’s ability to innovate and appropriate benefits of innovation”?

In their study involving 150 articles on open innovation, all available in the Web of Science, the authors found that there is a variety of definitions and objectives, thus making it difficult to compare and evaluate the advantages and disadvantages of the open innovation.

The most used concept is that of Chesbrough (2006), and the authors highlight four reasons for using it: 1) the concept reflects economic and social changes in the labour patterns as employees are more interested in their careers than simply working for the same employer for all their lives; 2) globalisation allowed the work to be further divided; 3) organisations can sell their ideas, and 4) new technologies allow new ways of collaboration and coordination throughout the world.

These studies have shown that companies vary in the degree of use of external inputs in their innovation process. In general, companies need to be competent in the areas related to their partners in order to assimilate and co-develop ideas originated from external sources. Therefore, it is interesting to assess the benefits and costs regarding the open innovation.

As a result, Dahlander & Gann (2010) developed a two-dimensional analytical frame to evaluate the studies on open innovation: inbound (acquiring and sourcing) and outbound (selling and revealing) innovations *versus* pecuniary and non-pecuniary approaches in order to assess the reasons by which some companies gain and others lose with the open innovation.

1) *Revealing: outbound innovation – non-pecuniary*

This type of openness refers to how much the companies reveal about their internal resources without immediate financial rewards, considering the indirect benefits for the companies. The authors emphasise, for example, that revealing the developed knowledge increases the opportunity of drawing attention from others, but this is also a challenge as the companies have to decide on which resources they will divulge to the external environment. In general, the big companies have committees to decide on whether a given technology will be patented or divulged. On the other hand, the small companies lack these resources for structuring such a process.

2) *Selling: outbound innovation – pecuniary*

This type of openness refers to how the companies trade their inventions and technologies by selling or licensing the resources developed in other organisations. The great advantage of this process is that it is becoming increasingly common, and the company can boost investments for R&D in partnership with its partners in order to introduce the invention to the market.

The disadvantage is the so-called "disclosure paradox", that is, when a technology is licensed, the patent owner reveals information to the potential licensor without receiving any payment, and the latter can act opportunistically and develop the idea. Therefore, it is necessary that both seller and buyer establish a contract addressing these issues.

3) Sourcing: inbound innovation – non-pecuniary

This type of openness refers to how the companies can use external sources of innovation. The rationale is that the more external sources of innovation are obtained the more open is the company's research strategy. Dahlander e Gann (2010) highlight that the literature on open innovation shows that companies should seek, select and develop new products and services from discoveries made by third parties.

The disadvantage is the fact that not all companies are prepared for partners with external sources of innovation. According the authors, there are significant variations in the degree by which companies adopt an open innovation.

4) Acquiring: inbound innovation – pecuniary

This type of openness refers to the acquisition of inputs for the innovation process by means of the market, that is, how companies license and acquire knowledge from third parties. Companies licensing or acquiring knowledge from third parties should have research expertise and know how to assess technologies. The difficulty with this open innovation approach relies on integrating external ideas into the company's profile. If the inputs are far from the company's reality, it will be difficult to align them; and if the inputs are too similar, it will be complicated to make new combinations.

The authors found that the majority of the studies analysed addressed one or two different types of innovation practices. Moreover, they emphasise that there is a gap in this area, which is to find how different forms of openness can be combined. Chesbrough (2012) points out that a critical question for companies is to choose between different practices of open innovation for development of their business model. Therefore, according to Dahlander & Gann (2010), further studies should focus on how different forms of openness can work together for a given performance.

Even through this survey, Dahlander & Gann (2010) identified two types of costs resulting from the collaboration with external partners: coordination and competition costs. The coordination cost refers to the difficult in overcoming organisational borders due to the differences between the organisations. Moreover, keeping several relationships is expensive and can remove the managerial focus. On the other hand, the competition cost refers to the risk that one of the players act harmfully, including the costs with protecting the inventions from others. Therefore, the analytical picture developed by the authors provides an overview of the advantages and disadvantages regarding the several practices of open innovation. Another very important issue is to assess how open innovation and business models are being articulated.

Chesbrough (2012, p.2) emphasises that the business model presents two relevant features: “it creates value and it captures a portion of that value”. Doganova & Renault (2009) state that the business model is aimed at presenting a value created and shared by the business, allowing a synthetic explanation of complex processes.

The models of open business capture the value of external ideas or business from other companies. For example, Chesbrough (2012) cites the case of Genzyme, an American biotechnology company succeeding in licensing a technology from an external company and then developed the idea, resulting in a set of new therapies for treatment of rare diseases. According Chesbrough (2012), the company also succeeded in recording profits in the sector, a fact not so common among most of the biotechnology companies. In this case, the company is not limited to the markets it supplies directly, participating in other segments by means of licensing, joint ventures, etc. This model becomes attractive as it decreases both R&D costs and mean development time by using external technology.

According to Chakma (2009), the “virtual model” is an option to be considered by the bioscience companies. With this business model, the companies outsource their operations to a

network of collaborators and then concentrate on both strategic activities and management of already established partnerships. Therefore, this model can speed up the development of products by means of either emerging or already constituted enterprises. The model has the following advantages: a more flexible business format and a lighter structure with less investment in physical infrastructure, since third parties' facilities are used (e.g. universities, research institutes, and specialised service suppliers. The companies can have access to these partners in Brazil or overseas, since several areas of this sector still need to be developed.

Beyond the open innovation, another useful concept for understanding the development process of innovations by means of partnerships on a worldwide basis is the metanational organisations developed by Doz, Santos & Williamson (2001). These authors emphasise that in the past an international company should be able to have access to several markets around the world. Nowadays, however, successful companies are those capable of creating value by seeking technologies not yet explored. The authors also state that competitiveness of the companies depends on their capacity to identify technologies they need, wherever they are, in order to transform them into innovation and value.

The metanational companies should develop some capacities, such as absorbing new knowledge more quickly than their competitors, mobilising dispersed knowledge to innovate with more creativity, and operating these innovations more quickly than their competitors.

In this sense, the model presented by Doz, Santos & Williamson (2001) show that a company from a developing country may apparently be in an improper environment for competing globally. However, these companies can develop competencies for prospecting, obtaining and operating technologies and knowledge from exterior market and then put themselves in a more competitive position.

Therefore, innovative companies from countries which are not developers of technology in the areas of knowledge relevant for them, as is the case of the bioscience sector in Brazil, should create a way of obtaining such knowledge wherever it is. As a result, the meta-national model can be a way for Brazilian innovative companies to act on a worldwide basis.

The structure of the model consists of three pillars: sensing, mobilising, operationalizing. In the first pillar, the company identifies new technologies, relevant know-how, leading consumers' new habits, and knowledge not exploited and/or sub-estimated by the competitors. This search should be concentrated and involves four aspects: WHAT to seek (market technology

or knowledge), WHERE to seek (country, region, cluster, etc.), WHO can provide the knowledge (universities, research centres, clients), and HOW to have access to the knowledge (partnerships, licensing, hiring, etc.)

The second pillar refers to the organisational structure by which the knowledge raised in the first step will be gathered and transformed into innovative products and services. The third pillar covers operational activities required for making innovation available to the market with competitive advantages.

Swoboda et al. (2011) have also emphasised the importance of alliances for small and medium-sized companies, as is the case of the majority of the companies operating in the bioscience sector. According to the authors, international alliances allow them to have access to several countries at a reduced risk. As stated by Bierly & Gallagher (2007), the authors also define international alliances as being joint ventures, licensing and f production and distribution agreements.

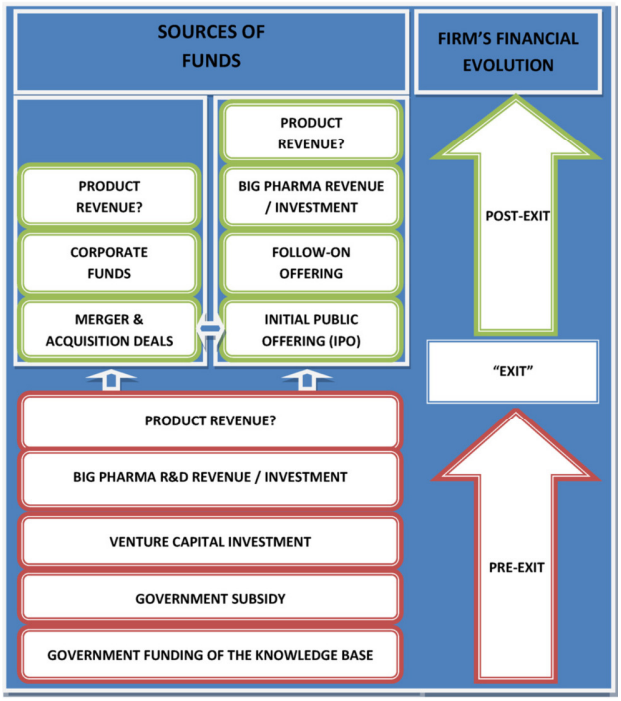
The authors point out that successful international partnerships involving small and medium-sized companies depend on how the alliance is established. For example, partner selection and basic negotiations; objectives, rights, obligations, contribution of each part; and cultural adjustment, structure and strategy of the partner. A successful alliance can be observed by its effectiveness, that is, when the objectives established by the business strategy of the alliance are met, including performance (e.g. sales, profit, flow cash, ROI growth) and efficacy (e.g. transaction costs).

It is worth emphasising that leading with different cultures, confidence, negotiations and agreements in international alliances is more crucial compared to national alliances. Although alliances are an option of internationalisation depending on the case, other options should be taken into account such as creating a subsidiary or exporting to a given country of interest.

It is also worth mentioning the sector's financing structure, which is an extremely important factor to be analysed in the study. The American biotechnology industry has adopted the following financing model: in the first decade of existence, 10 percent of the company's financing comes from venture capital, 50 percent from R&D alliances with pharmaceutical companies, and 40 percent from public share market (LAZONICK e TULUM, 2011). Another important player in the biotechnological industry is the government, which finances basic science activities by means universities, research institutes, laboratories and medical centres.

According to the authors, the American biotechnology industry's financing structure consists of government, which finances the basic science development (including other subsides), venture capital, and pharmaceutical companies, which invest in start-ups for development of new drugs. Therefore, by means of mergers, acquisitions, and IPOs, both venture capital and big pharmas ensure the return of long-term investments in these start-ups which are developing new drugs, although there is no guarantee that such drugs will be commercially viable and generate revenues.

Figure 1. The US biopharmaceutical funding structure.



Source: LAZONICK & TULUM (2011, p. 1184).

By means of their study, the authors emphasised the need to invest heavily in the development of new drugs and financing the biological industry sector. Until the crisis of 2008, the business model was financed by venture capital, R&D alliances, and share market. They also report that it is early to state that if speculative money does not return to industry, then the sector will be less financed and funds will have to be more strategically used to choose which drugs should be developed based on their commercial potential. Finally, they add that the persistence of

American government in supporting the biotechnology industry by financing the National Institute of Health (NIH) and giving subsides will not allow the highly-financed biotechnology industry to end.

3 Methodology

Next, the methodological aspects of the research studies seeking to achieve their objectives will be discussed. In view of what has been addressed above, the aim of the present study is to analyse which are the main factors for a successful process of innovation development in the Brazilian bioscience industry as well as suggest a business model to aid all stakeholders involved in this sector.

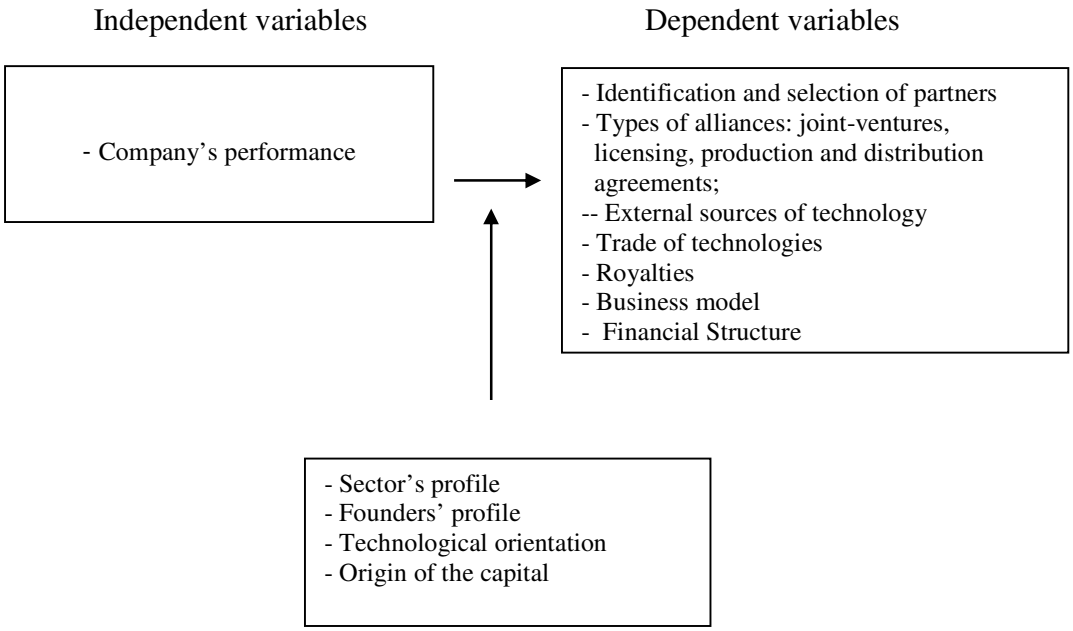
According to the approach given to the above-mentioned research problem, this study is characterised as exploratory-descriptive and will have two phases: the first phase is characterised as qualitative, in which case studies will be conducted in order to raise and identify the most important variables in the innovation process, including their steps; the second phase is characterised as quantitative, in which a survey will be carried out by means of structured questionnaires in order to assess whether the aspects raised in the qualitative phase can be generalised as a whole. Both phases will be used for proposition of the above-mentioned model.

In the qualitative phase, three national companies and a foreign company considered as the most expressive ones in the bioscience sector were chosen for the case study. In the quantitative phase, structured questionnaires will be sent to all companies operating in Brazil.

In Brazil, this sector involves 271 bioscience companies (Biominas Brasil/PwC, 2011). Data analysis of the qualitative phase will be a content-based approach (Bardin, 1977), whereas the quantitative phase will be performed by means of statistical analyses.

A conceptual model can be viewed below, serving as reference for conducting research studies and being constructed from theoretical survey until the present moment.

Figure 2 Research model



4 Preliminary Results

Two pilot case studies have been conducted with two biotechnology companies in Brazil. These companies were chosen because of their national influence. Recepta Biopharma is recognised as a case of open innovation and Invent Biotechnology is highlighted among the biotechnology companies incubated at SUPERA.

Interview script was based on both meta-national theory and open innovation, basically assessing how companies use external partners in their development process in Brazil and overseas, how they seek and select these partners and how these partnerships are operated, and if they have already had any technology transfer or if acquired technology from some external partner. A brief description of the cases follows below.

Interestingly, a survey of all bioscience companies operating in Brazil was performed based on patent indicator. It was also found that the amount of patents applied by these companies in Brazil is still low, as well as the number of partnerships, since a small number of co-owned patents were identified.

4.1 Recepta Biopharma

Recepta Biopharma is a biotechnology company dedicated to research and development of new pharmaceuticals for cancer treatment. The company researches and develops two types of bio-molecules: monoclonal antibodies and peptides, which are used for tumour cell-directed therapies. These bio-molecules have been shown to be a good therapeutic option for cancer patients in terms of control and prevention of metastasis.

The company was established in 2006 and has Brazilian member investors and the Ludwig Institute Cancer Research. The participation of the Ludwig Institute as shareholder allowed Recepta Biopharma to be immediately inserted into the international scenario, including access to the Institute's contact network. The Ludwig Institute has branches worldwide and as a partner it is widely compromised with the company's activities. Moreover, the research carried out by Recepta Biopharma counts on the collaboration of the Ludwig's researchers, thus additionally validating scientific and technological procedures as well as the quality of the processes performed by the company.

The company has established itself in Brazil because of the good service infrastructure required for the company's business, namely: existence of highly-qualified scientific and technical personnel; hospital facilities with physicians and technical staff with documented experience in performing clinical tests; excellent CROs (contract research organisation) and logistic companies; easier access to phase I and II clinical tests for patients compared to traditional centres (USA, Europe, Japan); stimulation of innovation culture; existence of several financial programs supporting the technological innovation (e.g. FINEP, BNDES, FAPESP, CNPq); and prioritisation of pharmaceutical and bio-technological development, which is expressed in the government's policy for the sector (e.g. PITCE – Industrial, Technological and External Trade Policy).

Nowadays, the company is working with two monoclonal antibodies licensed by the Ludwig Institute to Recepta Pharma and which are at different development stages (both in clinical studies). Recepta Pharma is also developing research on new peptides and antibodies in order to generate patents for the company.

The Recepta Pharma's development process of new technologies is decided by an administrative council. This council is comprised by Brazilian investors, two Ludwig's members

and the company's CEO. The idea of developing a technology is presented to the council, who will discuss the viability of such a technology and make the development planning.

All developments of the company are performed by means of several partnerships with universities, hospitals and national or international research institutes, which is the key factor for the success of Recepta Pharma. The company has an internal team (one program director, one clinical director, one project director, two scientific consultants, one pharmacist, who also accounts for regulatory issues, and a test assistant) who works as the company's brain by defining what can be done, how it can be done and how the work should be performed (i.e. who will be the partners, amount of investment, possibility of using some input for innovation, etc.).

The company also counts on an external team who works in the laboratories of scientific-technological institutions. This team consists of 25 researchers working at institutions such as Butanta Institute (research on cell biology), School of Medicine of the University of São Paulo (immune-histochemical research), Federal University of São Paulo, and Ludwig Institute in São Paulo (development of new antibodies and pre-clinical studies). The decision to have one team working with each partner is viewed as being strategic to the company, since the objective is to have people compromised with the projects under development, prevent loss of focus, and ensure a pace necessary for development of the projects.

Recepta Pharma performs research jointly with these partners and by means of resources granted by national support agencies, such as FINEP and FAPESP, develops new laboratories and purchases equipment, thus allowing academic results to the partners as scientific articles are produced and there is knowledge transfer, opportunity of taking part in first-line research, and equipment modernisation. After the project is finished, the generated infrastructure is then given to the partner.

In addition to the scientific-technological institutions, the company has relationships with various hospitals for performing clinical tests in Brazil, such as Sírio-Libanês, Oswaldo Cruz, Albert Einstein, Instituto Nacional do Cancer (*INCA*) Instituto Brasileiro de Controle do Câncer (*IBCC*), Hospital da Baleia (*BH*), Instituto do Câncer do Estado de São Paulo (*ICESP-HC*), Hospital de Clínicas, and Hospital São Lucas (*POA*-RS).

Moreover, Recepta Pharma also keeps partnership with MIT's G-Lab – Sloan School of Administration – for development of business planning and analysis of the viability and creation of its own development.

The company has a well-defined PI policy with all partners and holds the property of all generated technologies considered essential for it. If the ownership of related processes or other products emerges during their development, then PI can be divided. However, there is still no standard policy regarding percentage of co-ownership or share of royalties, which will be addressed case by case.

Recepta Pharma is also the pioneer in the development of know-how for clinical studies in Brazil, being recognised as a company who masters such a process. According to Perez, the company's CEO, Brazil has infrastructure, qualified personnel and patients have easy access to clinical tests.

4.2 Invent Biotecnologia

Invent Biotecnologia is a spin-off company of the University of São Paulo. The company was established in 2006 by three post-graduate students at the Ribeirão Preto School of Medicine to work with the development of human and veterinary products. The company is focused on developing three segments of products: antibodies, vaccines, and immune-modulators.

The company has already benefited from several government programs aimed at supporting technological innovation, such as PIPE (Innovative Research for Small Enterprises) of FAPESP, FINEP and *RHAE* (human resources in strategic areas) fellowships of CNPq.

In 2008, the company established a partnership with the University of São Paulo (USP) to develop a vaccine for prevention against infection by *Rhodococcus equi*, and in 2009 another partnership was made with USP for studies on cancer. In 2010, the company filed its first patent application for *R. equi* vaccine.

The development of technologies by Invent Biotecnologia is performed by prospecting for technologies in universities, whose potential of the academic project is assessed in terms of commercial viability. Difficulties for entering a given market and patent issues are also addressed because of the importance of this asset for the biotechnology sector.

The company also develops its own products, called platforms, which will be accessory technologies for development of antibodies and vaccines. Nowadays, due to the size of the team, the company can develop two or three technologies in its pipeline.

The Invent Biotecnologia's objective is to develop technology and license it to interested companies. The company also intends to meet the challenge trial and pre-clinical standards in veterinary and human areas, respectively, and then transfers technology to a major pharmaceutical company, for example.

The company seeks partners depending on the necessities and has no systematised database, only contacts made in non-scheduled visiting events.

If needed, the company will seek partners overseas according to their competence in the area of interest. Once such partners have been identified, the company makes contact with them directly. However, Invent Biotecnologia's seeks those partners who already know its technology by means of the marketing carried out by the company.

The company publishes the results after applying the patent, thus facilitating the search for partners for technology development. In the case of the vaccine, the partner already knew the Invent Biotecnologia's activities as well as its technology, which led to the partnership in order to develop a vaccine according to the challenge trial standard.

According to the Invent Biotecnologia's CEO, the company has not yet consolidated a good marketing policy, but three interesting advertising tools can be identified: publication in international scientific periodicals, participation in events, and production of press releases on technology. There are specialised companies in the sector which divulge pertinent information, mainly to the pharmaceutical industry, which is one of the main target public of the company.

Moreover, Invent Biotecnologia seeks to take part in the major biotechnology events in order to find partners, venture capital and potential purchasers for its technologies.

The company's strategy in seeking foreign partners aims at divulging its technologies, since the national partners usually want finished products and the value of technology transfer is low. By performing a test in other country, both visibility and credibility of the company increase regarding the analyses made.

Invent Biotecnologia intends to set up a new company overseas in order to seek investors and purchasers for its technologies. It will be a spin-off company in which the Brazilian unit will have share participation.

Due to the importance of the American biotechnology industry and FDA regulatory aspects, the company intends to set up the new company in the USA. In fact, this will be the beginning of an internationalization cycle.

Invent Biotecnologia does not depend on outsourcing companies to find potential partners or investors. According to the company's CEO, this is a common practice worldwide and they are in contact with these companies due the internationalisation process.

Moreover, the company has well-established processes for operationalization of these partnerships by means of material transfer agreements, confidentiality agreements, conventions, etc.

Although no transfer technology has been made yet, the company filed a patent application in conjunction with the University of São Paulo.

The company's CEO emphasised that lack of investment is the major difficulty faced by the sector in Brazil. In fact, the Brazilian scenario is not favourable for the sector as investors lack experience and they want results at short and medium terms. According to them, there are governmental actions but they are not articulated enough.

Therefore, the company has changed its strategy by developing its core business and will seek partners for development of products to be sold overseas by means of internationalisation.

5 Concluding Remarks

Innovation has become an imperative factor for companies to survive the globalised world. By means of several types of innovation at either organisational, incremental, technological or production level, the companies can have access to new markets, increase their revenues, acquire new knowledge, make partnerships, attract and retain talents, generate new business models, aggregate value to its image before clients, suppliers, competitors and partners. Therefore, this theme has become central in the agenda of all countries.

The bioscience sector is characterised by high innovative potential and strong technological content. As observed in the literature, however, costs with R&D are high and the mean time for developing a new product is long. Therefore, the sector's companies often opt for making alliances in order to minimise these risks.

Bliemel & McCarthy (2008) pointed out that biotechnology companies need two components to survive: human capital and investments. In this way, one can emphasise the

importance of making partnerships with universities for obtaining talents as well as for having access to public funds, mainly in the beginning of the existence of these companies.

Moreover, one can also emphasise that these companies need to have a global perspective. Chesbrough (2006) highlights the concept of open innovation in which external sources of innovation will have more importance. Within this context, it is also emphasised the new forms of co-ordination and collaboration of partnerships around the world.

Dahlander & Gann (2010) described four ways by which companies can benefit from the practice of open innovation: revealing, sourcing, selling, and acquiring. As stated by the authors, there are a few studies in the literature assessing the use of such a practice by the companies, and it would be an excellent opportunity to evaluate how they benefit from the open innovation.

Based on the results from preliminary studies, one can observe that Invent Biotecnologia uses two strategies: the revealing approach, in which its technologies are divulged following patent application, thus being considered by the company's CEO an excellent option as it is also helpful for seeking partners; and the sourcing approach, in which the company seeks and selects external sources overseas. This latter approach is influenced by the former.

On the other hand, Recepta Biopharma created a company after acquiring two peptides from the Ludwig Institute and further developed them. Therefore, one can observe that both acquiring and sourcing approaches had been used by the company for seeking partners in several countries so that the development of its products could be continued.

Another relevant characteristic among the biotechnology sector's companies is how they capture values by means of their business model. It was found that both Invent Biotecnologia and Recepta Pharma captured values of external ideas and they are following a way which indicates a good performance for both.

Recepta Biopharma uses the virtual model suggested by Chakma (2009), that is, the company uses the partners' infrastructure because of the lack of one.

Moreover, it is worth mentioning the meta-national model as there is a certain convergence towards the concepts of open innovation. The structure of the model consists of three pillars: Sensing (identification and access), mobilising and operationalizing. It was found that the above-mentioned strategies of revealing (sensing), sourcing (mobilising), acquiring, and selling (operationalizing) are present in the meta-national model.

In the model presented by Doz, Santos & Williamson (2001), a company from a non-industrialised country can that a company from a non-industrialised country may apparently be in improper environment for competing globally, as is the case of Invent Biotecnology in Brazil. The company needs to capture value by using the three pillars and obtain competitive advantage. Both Recepta Pharma and Invent Biotecnologia are using these strategies despite having little experience in terms of operationalizing.

Another issue regarding the meta-national model which deserves attention is the fact that these companies can absorb new knowledge, mobilise dispersed knowledge to innovate with more creativity, and operationalize the innovations more quickly than their competitors. However, one should assess whether the partner is really adequate enough so that the objectives of the partnership can be achieved.

Swoboda et al. (2011) corroborate this fact, that is, successful international partnerships involving small and medium-sized companies depend on how their alliance is built, such as selection of partners and basic negotiations (e.g. objectives, rights, obligations, contributions from each part), as well as on adjustments to the partner's culture, structure and strategy.

Finally, Lazonick & Tulum (2011) point to the need of financing the biotechnology industry sector by either venture capital or governmental subsides. This is a key issue for the success of such companies.

Therefore, based on the case study on two successful companies, one could find that these companies had to make partnerships in the development process of technologies in Brazil or overseas, besides capturing value from external sources. Preliminarily, it was also observed that these partnerships lack a good management, including improvement of internal processes, and financing infrastructure of the sector is needed to allow more successful cases in Brazil.

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