



### STRATEGICAL PARTNERSHIP APPROACH FOR INNOVATION OF MEDICINES IN BRAZIL ABORDAGEM DE PARCERIA ESTRATÉGICA PARA INOVAÇÃO DE MEDICAMENTOS NO BRASIL

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#### Abstract

For a country, innovation in medicines increases companies' competitiveness, bring new options of treatment to patients, have positive impact in the economy and develop knowledge. And partnerships between universities and pharmaceutical companies are good strategies to achieve these goals efficiently in Brazil. The purpose of this paper is to investigate the participation of pharmaceutical companies in strategic alliances with Technological Innovation Centers (TICs), from Brazilian Universities, aiming the developing of new medicines after the publication of the Innovation Act in Brazil. A survey of twenty-five TICs, and sixty-three pharmaceutical companies based on Brazil and involved with Research and Development (R&D) was used to a descriptive evaluation, through quantitative and qualitative data from structured questionnaires. Based on triple helix model, the results allow reflections on the relationship between industry, government and university to promote innovation in medicines in Brazil. Aspects related to a new management model, the influence of government initiatives, the criteria used by companies to create partnerships, as well as the actions to be taken by the universities for the success of this type of alliance are presented.

Keywords: innovation, strategic alliance, pharmaceutical, industry-university partnership

#### Resumo

*Para um País, inovação em medicamentos aumenta a competitividade das empresas, traz novas opções de tratamento para os pacientes, tem impacto positivo na economia e desenvolve conhecimento. Parcerias entre universidades e empresas farmacêuticas podem ser boas estratégias para alcançar eficientemente estes objetivos no Brasil. O propósito deste trabalho é investigar a participação das empresas farmacêuticas em alianças estratégicas com Centros de Inovação Tecnológicos (CITs), das universidades brasileiras, com o objetivo de desenvolver novos medicamentos após a publicação da Lei de Inovação no Brasil. Uma pesquisa com 25 CITs e 63 empresas farmacêuticas brasileiras envolvidas com Pesquisa & Desenvolvimento (P&D) situadas no Brasil foi utilizada para uma avaliação descritiva, através de dados qualitativos e quantitativos a partir de questionários estruturados. Baseado no modelo da tríplice hélice, os resultados permitem reflexões no relacionamento entre indústria, governo e universidade para a promover inovação de medicamentos no Brasil. Aspectos relacionados a um novo modelo de gerenciamento, a influência de iniciativas governamentais, ao critério utilizado pelas empresas para criarem parcerias, assim como as ações a serem tomadas pelas universidades para o sucesso deste tipo de aliança são apresentados neste artigo.*

Palavras-chave: inovação, aliança estratégica, farmacêutica, parceria universidade-indústria

#### 1. INTRODUCTION

One of the pillars of competitiveness is technological innovation. According to Schumpeter (1947), firms innovate aiming mainly profit and to maintain or create competitive advantage.

For the pharmaceutical industry, innovation is the keyword. Considered science-based, innovation it is a key source of intra-industrial competitiveness, and generates significant impacts on public health of a country (Radaelli, 2006; Grewal, 2008).

Industry executives estimate that for a laboratory to remain competitive it must invest at least two billion



dollars per year in Research and Development (R & D) due to the complexities of the developmental process as well as government regulations (Bôas 2007; Grewal, 2008).

An OECD study (1996), placed great emphasis on encouraging the strategic role of knowledge (investments in R & D, education and training) as a key pillar for business innovation. Thus, government policy should create conditions through macroeconomic and structural actions in order for the companies to make investments and significant innovative activities for the economic development of a country. Structural actions can be: the educational system of the population, the communications infrastructure, access to capital through financial institutions, regulatory aspects, and market accessibility (OECD, 1996).

The number of patent applications by universities in Brazil has increased and the health area is greatly represented (Sennes *et* Mendes, 2009), which indicates that Brazilian universities are looking to the market with a more entrepreneurial vision, although they do not undertake market research by technological demands (Pereira, 2009).

However, the university-industry interactions are not significant and still face many difficulties in their development (Rocha, 2012).

In Brazil, even with the Innovation Act, of the Three hundred fifteen companies in the manufacture of pharmaceutical chemicals and pharmaceutical innovations implemented in 2009, only fourteen have made partnerships with universities according to Brazilian Institute of National Statistics and Geography, known as IBGE (IBGE, 2010).

In addition to eliminating bureaucratic obstacles, there should be more resources for funding and especially a greater synchronization between the private sector and Academia where there are many resources that do not return to the market as products (Goldberg, 2010; Machado, 2010).

Whereas the international scene for some time has already recognized the importance of innovation for universities, this paper has as its main objective to present the results of a research project that investigated the participation of Brazilian universities in relation to the formation of strategic partnerships aimed at developing drugs, after the advent of the Innovation Act in Brazil.

Therefore, in order to delimit and define more concrete goals, the study will seek to answer the following questions: What kind of management should be supported by pharmaceutical companies so that the partnership with universities is a viable competitive strategy for innovation

in medicine in Brazil? How effective is the government in entering the university as an important intellectual capital for innovation of medicines in the Brazilian industrial park? What kind of activities should be developed by the universities for the creation of new medicines in Brazil, resulting from the partnership with the pharmaceutical industry, be more expressive?

## 2. THEORETICAL BACKGROUND

### 2.1 Pharmaceutical companies and open innovation

Strategically firms create partnerships that can be external sources of innovation and risk and cost reduction (Tidd, 2008).

The concept of "Open Innovation" means that companies can no longer depend exclusively on their internal research and should acquire inventions or other intellectual property from external partnerships (Chesbrough, 2006).

According to Hunter and Stephens (2010), *open innovation* is a valuable model for large pharmaceutical companies because it provides considerable flexibility, helping the industry to keep their competitiveness.

Several models attempt to illustrate and analyze the Science and Technology. The most relevant so far was the linear model of innovation whose knowledge flow sequentially from the basic research (universities) to the applied research, which is then transferred to the industry (Kunz, 2003).

Another model was presented by Etzkowitz and Martin, suggesting that the closer links between universities, government and industry can be expressed in terms of a "triple helix" model. In which, universities are seen as having a third new mission (beyond the two traditional missions of teaching and research) to contribute to the economy (Martin *et* Etzkowitz, 2000)

### 2.2 Aspects of innovation in the pharmaceutical industry in Brazil

Although Brazil is figured as the 8th market for drugs in the world, its production has been maintained from imported technology that there is still the lack of tradition to innovate (Interfarma, 2010). The country has the potential to share in scientific and technological research, which has been restricted to the academic or governmental institutions and has not interacted with the business sector which generates wealth (Vieira, 2008).

xtremely important, the pharmaceutical sector has been prioritized by the Brazilian Government as one of the strategic



options to compose the Brazil's Industrial, Technological and Foreign Trade Policy. Under this policy, the encouragement of R & D is one of the bases to underpin the sector, which has innovation as a key element for the growth of industrial competitiveness (Saúde, 2008). However, the business environment is not conducive to the research environment and the lack of a culture of innovation, as well as the speed to increase the portfolio with new products, sacrifices the research, which can not occur at a rate of production. (Cuatrecasas, 2006). It is important to emphasize the National Policy on Science, Technology and Innovation Management, of the Brazilian Ministry of Health, aims at greater integration between academia and industry through the "implementation of development policies of the health production complex, integrating and strengthening research centers and technology, official laboratories, institutions of higher education, vocational and medium domestic enterprises, with emphasis on research and production of medicines, products, processes and equipment for health care" (Saúde, 2008).

### 2.2.1 Pharmaceutical industry-university partnership

Due the importance of innovation for the economy, the Law nº 10.973 published in 2004 in Brazil (Brasil, 2004), known as Innovation Act was considered an advance for the Brazilian government in the sense that increases flexibility and the patent rights of the University, because it creates the Technological Innovation Centers (TICs) with the objective of facilitating the process of developing university projects with potential interest to the private sector and helping the transfer of technology to the business sector through licensing (Sbragia, 2006). To Dzisah and Etzkowitz (2008), "the concept of *triple helix* would be used in Brazil through the Innovation Act."

Countries considered innovative have been making strategic alliances with universities for a long time. In the last decade, only the U.S. were more than one thousand partnerships between companies and the Academy (Elmuti, 2005; Schwab, 2010)

Examples of success stories from the university's partnership with the pharmaceutical industry are the patents of the anticoagulant Warfarin and Vitamin D (University of Wisconsin), the antitumor agent cis-platinum (Michigan State University); the patent the vaccine against the bacteria *Hemophilus* causing meningitis (University of Rochester) and the antineoplastic Taxol® (Florida State University) (Demain, 2001). In Brazil, the only totally Brazilian drug is the anti-inflammatory topic Acheflan that was created in partnership with four major Brazilian Universities (Federal University of Santa Catarina, UNIFESP, PUC-Campinas, Unicamp) (Achê, 2011).

In relation to universities, some authors see this partnership as a possibility to generate technological innovation and intellectual property contributing to socio-economic progress, while the involvement in a business environment enriches the Academia. Moreover, there is a real possibility of reducing the expenditure on R & D by firms (Salomon, 2008). In the biotechnology sector, for example, a survey showed that there is less spending when there is a partnership between a company and a university (Elmuti, 2005).

The importance that university research has for the company's innovative capacity can demonstrate by several studies that pointed out the reasons why companies and universities create alliances. Among other factors, the universities, for example, collaborate with companies to test the practical application of research in society, look for business opportunities and generate income for the center of research and researchers. Companies, in turn, collaborate with universities to develop new products and processes, solve technical problems, risk sharing and improving the public image of the company, have access to new scientific research and university resources (laboratory, library instruments, etc.) and highly skilled labour. (Santoro, 2000; Lee, 1996; Kunz, 2003; Segatto, 1996).

Although there are several benefits, traditionally it is believed that there are factors that can compromise the university-industry partnership. Authors point out cultural differences, goals, and temporal factors as the main conflicts between companies and universities (Elmuti, 2005; Silva, 2007; Salomon, 2008; Demain, 2001).

While interest from both academia and industry can often be different, successful partnerships have been possible when both parties have a mutual respect of their interests, have a common interpersonal contact and especially avoid tension around intellectual property by publishing the study only after the filing of the patent (Demain, 2001).

## 3. RESEARCH METHODOLOGY

The data used for this study derive from research of the University-Pharmaceutical companies' cooperation and is characterized, by its nature, as descriptive, because it employs quantitative as well as qualitative data.

Thus this study was divided into two phases. The first phase was of a quantitative nature, using the questionnaires as survey method, focusing on the Centers of Innovation Technology (CITs) of the Universities and on the pharmaceutical companies respectively. This way, it was possible to compare the views and expectations of both parties together.

Although it is known there are difficulties in obtaining adequate answers using questionnaires, this method was



chosen because it provides the basis for answering the research hypothesis considering the positive approach for the purpose of this study.

The survey method appears to be the most appropriate for understanding the behavior of a relatively large sample inserted in a population. For this stage, the analysis of questionnaire data (quantitative phase), we used the Statistical Package for Social Sciences (SPSS).

To cover the qualitative elements, the second phase, a content analysis was carried out through the Technological Innovation Centers (TIC) and the pharmaceutical industries. Content analysis can be defined as an investigation technique that aims an objective, systematic and quantitative description of the communication content.

### 3.1 Validation and data collection

The pilot questionnaire was pre-tested by 5 (five) professionals (2 teachers and 3 masters/PhD) with experience both academic / research and academic / market. The final questionnaire was made available electronically through SurveyMonkey software ([www.surveymonkey.com](http://www.surveymonkey.com)), which allows sending and receiving the answers from the Internet. The questionnaire was made up of mostly closed questions, including multiple choice, semi-open, dichotomous and opinion evaluated by the Likert opinion scale of 5 points (where 1 is the lowest and 5 the highest concordance level). It also used some open questions in order to obtain "additional information" if the respondent wished to express an opinion relevant to the subject. Following the guidelines of Mattar (1996), identification of the respondents was asked only at the end of the questionnaire to assure there was no risk of distortion of the responses if the personal data had already been presented at baseline.

The survey was conducted between the months of May and June 2011. The population studied was the universe of 25 Technological Innovation Centers (TICs) listed in the website of the Brazilian Ministry of Development, Industry and Foreign Trade ([www.mdic.gov.br](http://www.mdic.gov.br)). Regarding pharmaceutical companies drugs, to be considered as part of the population studied, firms had to have tradition in R&D. From two thousand, four hundred, thirty-four companies, only sixty-three companies based on Brazil met this condition and have participated from this research.

In order to meet the objectives and answer the research questions, the questionnaire was developed and adapted from the proposal presented by Bekkers and Freitas (2008) and Lee (2000) and organized by the authors in five clusters: (1) institutional profile, (2) strategy, (3) participation of government, (4) knowledge / expertise, and (5) university as a strategic partner, with the following objectives:

#### **(1) Institutional Profile:**

a.University: Identify the profile of research available through the TICs after the Innovation Act. Validate the respondent as an active participant in the TIC and identify whether it has already had private sector experience.

b.Company: identify characteristics of the company as to size, nationality and maturity in the market. Validate the respondent as decision maker or a participant of the strategic decisions.

#### **(2) Strategy:**

a.University: Measure how much time is devoted to research and applied research and identify if these researches are guided by the market.

b.Company: identify the strategic vision of the company in the marketing of new drugs; to identify whether companies engage in R & D in Brazil and the main reasons that inhibit this initiative, to identify the profile of the company in the licensing options given by Innovation Act and if the company shows evidence for the Open Innovation profile.

#### **(3) Participation of the Government:**

a.University: identify the University's vision regarding the involvement and promotion of the Brazilian Government in the innovation of medicines as well as the participation of the Government as a funder; identify gaps in government action to stimulate the innovation of medicines.

b.Company: identify the perception of the pharmaceutical company in relation to the resources for R & D promotion and the influence of the Government for innovation; identify gaps in government action to stimulate the innovation of medicines by private pharmaceutical companies.

#### **(4) Knowledge / Technical Capacity:**

a.University: identify whether the academic researches available by the TICs are often patented prior to publication in scientific journals; to identify the perception of the university as to their technical training to meet the pharmaceutical companies in the development stages of new drugs.

b.Company: identify the perception of pharmaceutical companies on the technical preparation of the Universities in the development stages of new drugs.

#### **(5) University as strategic partner**

a.University: measuring the perception of the TICs as to their own professional profile and enabler of partnerships with business;





b.Company: identify whether universities are an option for partnership after publication of the Innovation Act; to identify if the partnerships with the Universities are going through TICs, as discussed by the Innovation Act; measure the perception of pharmaceutical companies about the professional profile of Universities as partners.

## 4. RESULTS AND DISCUSSION

### (1) Institutional Profile:

- Companies

35% of companies responded to the survey, 63.6% are multinationals.

50% of companies are mature (have more than 30 years in the Brazilian market) and 56% are large, thus having gross annual operating revenue greater than US\$ 150 million.

Managers and Directors were contacted and were responsible for nearly 80% of responses, where 83.3% of respondents influence or are involved in R & D, being distributed among the regulatory area (55.6%), R & D (16.7 %), strategic issues (11.1%), business development and corporate affairs (22.2%).

- Universities

56% of the Technological Innovation Centers (TICs) responded to the survey, where most were created after the Innovation Act (93%). Of the respondents of the TICs, 66.7% have already worked in a private institution and have been working for the TICs for over two years at least and included: directors (8%), engineers (33%), managers (8%), teachers (17%) and innovation agents (8%).

The research in chemical and pharmaceutical areas, which are important for development of new medicines and scope of this paper, was pointed out as the main areas that represent the researches that reach the TICs, converging to the objective of the study.

### (2) Strategy

- Companies

Attending to the scope of the present survey, the profile of the respondent companies showed more interest in new drugs (81.8%). In addition, strategically, companies see product innovation with a degree of importance greater than the release of copies as a way to maintain profitability and competitiveness (72.2% in total), corroborating Gadelha (2003) and Grewal (2008.)

Despite the maturity and the size of the majority of respondents, 43% of the companies do not develop any medicine R & D activity in Brazil, confirming literature (OECD, 2005; Yamane, 2009).

The reasons pointed out are related to very strict sanitary control / legislation (22.2%) and the long term return on investment (22.2%) followed by high cost and risk (11.1%). The respondent companies that have R & D to develop drugs in Brazil (57%), all have partnerships for drug development with consultants, commercial laboratories / R & D companies or others within the same group, with a frequency of 70% in the last six years. However, in this period, only 26% of companies had partnerships with universities meaning that 74% of companies did not see universities as an option for partnership, corroborating data presented by the Brazilian Institute of National Statistics and Geography (IBGE, 2010).

Focusing on the management profile of the companies surveyed, the non-exclusive license was not used by any company respondent as transfer of technology, showing a still quite conservative profile, characteristic of closed innovation. Therefore the transfer was made through exclusive licensing (50%) or through developing research within the university facilities (41.7%) or within the own company (25%).

- Universities

Compared to basic research, applied research has been identified more frequently by the CITs:

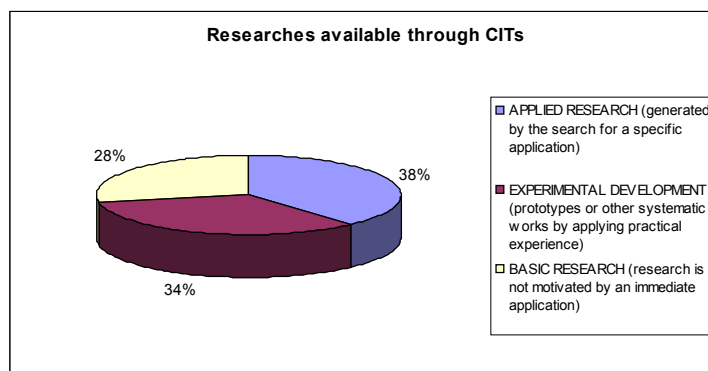


Figure 1. CITs – available researches

Source: The authors own



This result provides further perspective on the Elmuti study (2005) since he says that the universities only develop basic research. However, this result may be the result of a bias, considering that the studies that reach the TICs have come with the purpose of being licensed to market the due of the entrepreneurial vision of a researcher.

However, there is not a consensus among the TICs about the factor that guides the search for new drugs: if the government (36%), market (29%) or “other factors” (35%), such as “society’s demand,” “public universities,” or “depends on the source of funds”. This demonstrates the universities are not strategically aligned to the therapeutic needs of the market or the expectations of the Government’s public policies, which include drugs for neglected diseases. This discrepancy confirms what was presented by Pereira (2009), who attested the lack of market research conducted by the Universities is a reality. So even with a growing number of patent applications made by the Brazilian universities, as shown by Sennes and Mendes (2009), researches usually do not meet market expectations.

### (3) Participation of government

Pharmaceutical companies classified government action to encourage innovation in medicines from the private sector as “indifferent”, “irrelevant” or “less active” (61.2% of responses in total).

However, the direct and indirect funding provided by the government is what largely maintains the TICs (48%), followed by trade finance as a financing agreement (21%) and non-profit private research foundations (32%). However, there is not a consensus among the TICs about the Brazilian government being a facilitator at universities in relation to the incentive of researching new drugs. This approach came from the total number of respondents who believe the government is an “incentive” (50%) is equal to the respondents that labeled it as “indifferent” or “somewhat active” (50% in total).

In order to identify gaps in government action, several actions were identified by the pharmaceutical companies and universities as important factors for the real incentive for innovation of medicines:

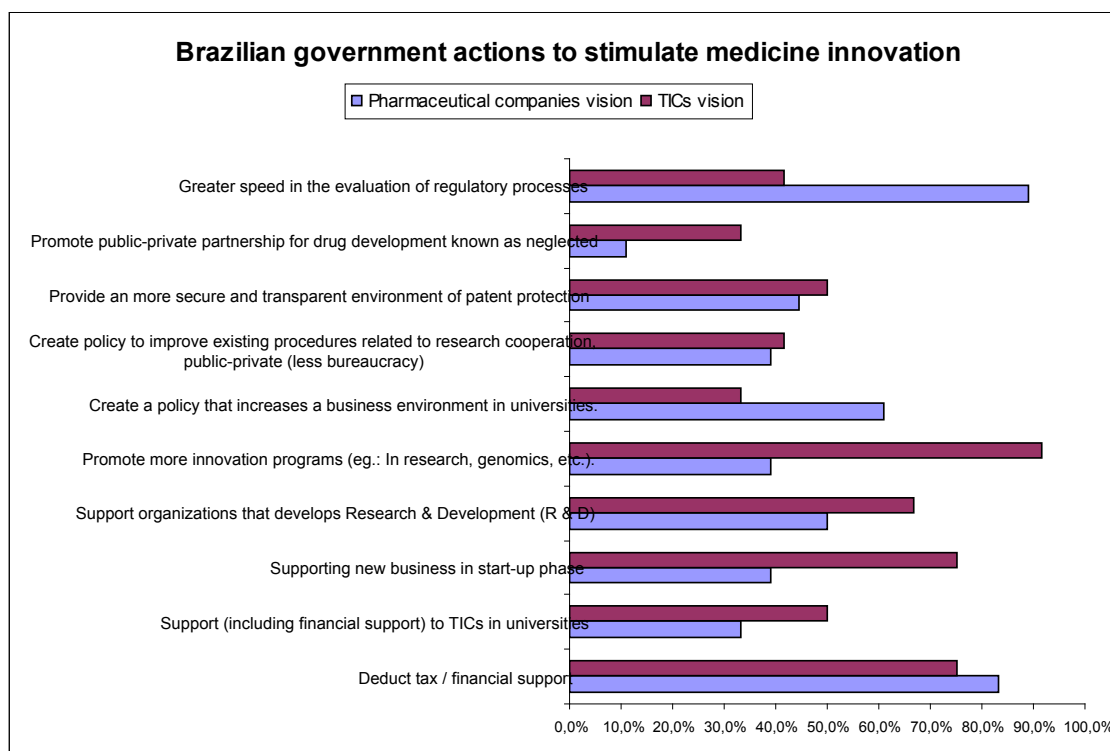


Figure 2. Brazilian government actions to stimulate medicine innovation

Source: The authors own

Mostly, the companies believe that greater agility in the evaluation of regulatory processes, where the evaluation of patent applications is included, would be more relevant to encourage innovation in medicines. The delay prevents the product being registered and hence marketed. As a result, companies lose competitiveness because the return on the investment is slow to happen.

The second most mentioned action by the companies as an instrument for the Government to encourage the search for innovation in medicines in Brazil is “deduct tax / financial support,” followed by the creation of a policy that stimulates a business environment in universities. Promoting partnership for development of neglected drugs



was the item less recommended by companies. This is not surprising because these medications do not generate high profits for companies, as discussed by Cuatrecasas (2006), demonstrating that companies do see innovation of drugs as a strategy to remain competitive and profitable in the market.

For the TICs, however, the best instruments for the government to increase and improve the search for innovation in medicine are to promote more innovation programs and support more businesses at the start-up phase as well as the deduction of taxes / financial support as mentioned by the pharmaceutical companies.

Thus, looking at the graph above, companies and universities seem to agree that providing an environment of a more secure and transparent patent protection, creating a policy to improve existing procedures related to public-private research cooperation (less bureaucracy) are also instruments that can be used by the government to increase and improve the innovation in medicine in Brazil. Acting in this way, probably it would be possible to use more often the research developed by the university, as discussed by Goldberg (2010).

#### **(4) Knowledge / technical capacity**

- Companies

Regarding the transfer of technology, the uncertainty regarding the patent is still a strong barrier against the transfer of knowledge between universities and pharmaceutical companies. Considering the score on the Likert scale for the companies, integrated projects with universities implies a significant risk of information leakage to competitors since it is "hard to manage" (3.61). Furthermore, being involved in the knowledge developed at the university is very costly in terms of time (3.33), and besides it is difficult to locate the knowledge generated by the universities (3.28). The companies did not agree (2.56) that the knowledge developed in universities is too theoretical to be used in the corporate environment; however, they do believe that "researchers working in universities do not fit into a corporate culture" (3.28). This confirms the conflicts between Academia and the private sector, as discussed by Vieira (2008).

- University

Through the Likert scale, according to the TICs, universities first express their knowledge through scientific documents such as: articles, publications in journals and conferences (4.00) instead of "gray literature" such as patents (3.14), even although some studies are available for licensing by companies. Universities recognize that there is no incentive to cooperate with industry, since the results are measured by the government through scientific publications (3.42).

In view of TICs there are still significant barriers to transfer knowledge from university to the industry (4.25), which end up using very little of the knowledge available in universities (3.58). It happens because there are difficulties to overcome cultural factors between universities and commercial interests of companies, since many partnerships are hindered by conflicts between the Academy that want to publish the results and the company that wants to patent research (3.58). However, as discussed by Demain (2001), points of conflict such as this could be overcome to ensure the success of the alliance if the patent was submitted immediately before the study becomes available to the scientific population.

However, universities agree that conducting this type of contract brings incomes and disagree that this type of partnership can not contribute to the development of research (1.33) or that industry is not interested in the knowledge developed at the university (1.67).

#### **(5) University as a strategic partner**

Of the 26.3% of the companies that have partnered with universities, 80% of those were satisfied with the partnership. This is extremely important and positive and shows that universities can be important partners of pharmaceutical companies and that a constructive exchange is actually likely to occur between both parties, showing the enormous potential that can still come of this type of alliance.

The companies and TICs points of views regarding universities as strategic partners are demonstrated in Figure 3.

For the respondent companies, universities can improve the company's image, have expert's researchers / highly skilled workforce and reputation for conducting research and meet the expectations of business, converging with some authors (Santoro, 2000; Lee, 1996; Kunz, 2003; Segatto, 1996).

However, the companies believe that universities are slow and bureaucratic, do not guarantee confidentiality / patent protection, have projects with very long duration, not feasible, are unpredictable and lack professionalism. Also do not believe that universities publicize their services and are easily accessible.

The universities, through the TICs also agree with the companies when they believe they can improve the companies' image and have expert's researchers / highly skilled workforce and reputation for conducting research and meet the expectations of business. However the TICs do not agree the universities can not ensure confidentiality / patent protection to companies or that they are slow and bureaucratic, those have projects with very long duration, not feasible, or do not publicize their services and are unforeseeable or lack professionalism.

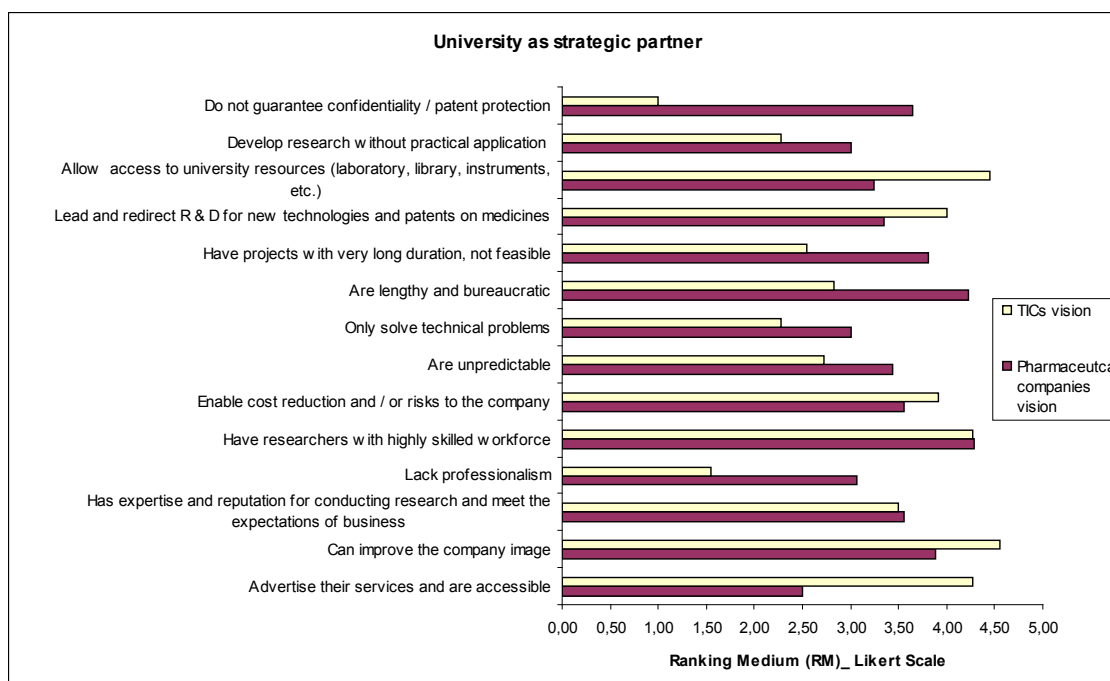


Figure 3. University as strategic partner

Source: The authors own

The facilities of the universities were not pointed as relevant to the respondent companies as the TICs believe and what also addressed by the same authors. However, in relation to a possible reduction in costs and / or risks, companies and universities are relatively consistent, confirming what was discussed by Elmuti (2005)

The gap between the two parties is essentially about management, where the vision of the University of its own skills as a strategic partner does not agree with the vision of companies on several points and therefore should be worked out.

It is therefore necessary that universities fall within the *triple helix* model and be more active in this context, seeking a closer relationship with the Government and the needs of the pharmaceutical market.

It is true that schools should not be dictated by market or commercial purposes, as believes Cuatrecasas (2006), but applied research should really be more included in society.

There is therefore a fertile field for universities as strategic viable partners. Apart from sharing the opinion of the companies in these issues, universities believe that this type of partnership enriches the research, attracts investment to the University and that companies could better use their resources and knowledge.

Inspired by the triple helix model and based on discussions of the present study, this paper proposes the following scheme which includes the critical factors necessary for the success of university-pharmaceutical industry partnerships as a strategy for innovation of medicines in Brazil:



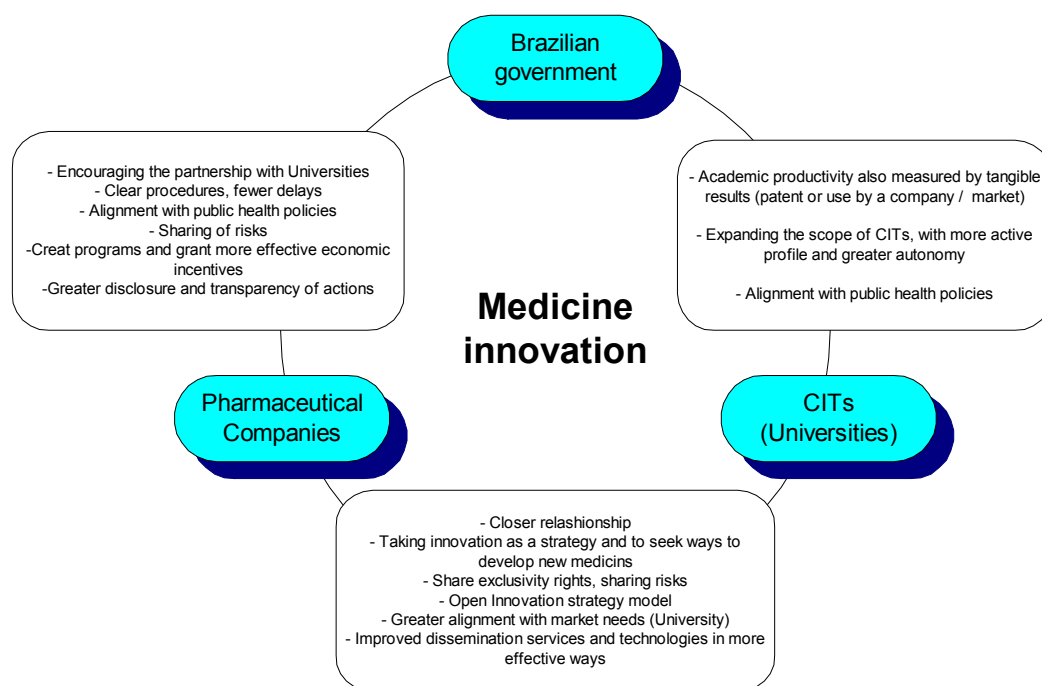


Figure 4. Government – pharmaceutical companies – universities: strategic interface for improving medicine innovation in Brazil

Source: The authors own

In general, this study demonstrated the companies rely on the expertise and technical capacity of universities to develop new drugs and also believe that the partnership can reduce and share risks, and gives a better image to the company. Moreover, the pharmaceutical companies that made partnerships with universities proved largely met.

## 5. CONCLUSIONS

Although the Innovation Act has been enforced for over seven years, it is still considered rather recent for Brazil. However, we need to change the view of Stal (2006), who said that universities have no tradition in business relationships and do not bother to transfer research results to the private sector in order to contribute to the production of innovations.

The present study is close, in general, to some empirical studies that discuss the partnership between universities and companies. However, it contributes more specifically when it covers the pharmaceutical industry sector in Brazil, prioritized by the Brazilian Government. This research showed that there were few partnerships / licensing between CITs and pharmaceutical companies after the Innovation Act (Rocha, 2011).

Regarding the type of management, it appears that pharmaceutical companies are still articulated through a closed innovation management model, characteristic of a centralized vision, dependent on patent exclusivity and

monopoly market. Therefore, with the adoption of an open innovation model, pharmaceutical companies could enjoy more of the Academia knowledge and become more competitive, as discussed by Hunter and Stephens (2010).

For this, as discussed by OECD (1996), the government could be an important ally in the creation of mechanisms to encourage companies to seek partnerships with universities across the TICs, including through the use of other forms of alliances, such as consortia and joint ventures. Therefore, in terms of how effective the government is at entering the university as an important intellectual capital for innovation of medicines in the Brazilian industrial park, we found that there is still much to be done in this direction, especially in the pharmaceutical industry, considered essentially science-based.

Beyond sponsorship, a much more direct support of the TICs is needed, which should have greater autonomy and participation at the University. Thus, the Government could change the way of measuring results and be more assertive in relation to the goals and research programs related to drug innovation within universities, where the results are still basically measured through scientific publications and where many researches are developed (sometimes even patented), but do not appeal to any investor to bring it to market. This can be a valuable way for the integration between academia and industry, as desired by the National Science, Technology and Innovation in Health, from the Brazilian Ministry of Health (Saúde, 2008).



Finally, addressing which activities should be developed more often by the universities for the creation of new medicines in Brazil through partnerships, the criteria and gaps pointed out by companies can be important actions to be taken for this purpose. Operating through offices linked to the University, the TICs have a professional structure that is closest to the requirements of the pharmaceutical market and could be important propagators of the universities technical and what they can add to companies in drug development. This research showed the TICs must make available their expertise, their services as well as their surveys in a more close and accessible channel to the pharmaceutical market.

Universities, on the other hand, do not seem to know the real demands of the market or even the Government's policies, including in relation to neglected diseases. We must, therefore, seek a closer relationship with the Government and the needs of the market / society so that universities should be more active in this context.

This paper achieved its objectives to investigate the participation of Brazilian Universities and pharmaceutical companies in strategic partnerships aimed at developing drugs, after the publication of the Innovation Act in Brazil. However, from the conclusions of this study, investigations that seek a more detailed and deeper investigation of this subject can lead to new findings.

## 6. REFERENCES

- Aché (2011), "Acheflan® Aerosol: da natureza vem o mais novo tratamento para traumas esportivos", available at: <<http://www.ache.com.br/PressRoom/News.aspx?NewsId=156>>. (Accessed on June 2011.)
- Bekkers, R. and Freitas, B. I. M. (2008). "Analyzing knowledge transfer channels between universities and industry: To what degree do sectors also matter?". *Research Policy*, v.37, n.10, pp.1837-1853.
- Bôas, G. D. K. V. (2007). "Oportunidades na indústria de medicamentos e a lógica do desenvolvimento local baseado nos biomas brasileiros: bases para a discussão de uma política nacional". *Caderno Saúde Pública, Rio de Janeiro, jun, 2007*, v.23, n.6, pp.1463-1471.
- Brasil (2004), "Lei nº 10.973 de 2 de dezembro de 2004, Dispõe sobre incentivos à inovação e à pesquisa científica e tecnológica no ambiente produtivo e dá outras providências". *Diário Oficial da União, Presidência da República, Casa Civil, Subchefia para Assuntos Jurídicos, Seção 1*.
- Chesbrough, H. W, et al. (2006). *Open innovation: Researching a new paradigm*: Oxford University Press, USA.
- Cuatrecasas, P. (2006). "Drug discovery in jeopardy". *Journal of Clinical Investigation*, v.116, n.11, pp.2837-2842.
- Demain, A. L. (2001). "The relationship between universities and industry: the American university perspective". *Food Technology and Biotechnology*, v.39, n.3, pp.157-160.
- Dzisah, J. and Etzkowitz, H. (2008). "Triple helix circulation: the heart of innovation and development". *International Journal of Technology Management and Sustainable Development*, v.7, n.2, pp.101-115.
- Elmuti, D., et al. (2005). "An overview of strategic alliances between universities and corporations". *Journal of Workplace Learning*, v.17, n.1/2, pp.115-129.
- Gadelha, C. A. G. et al. (2003). "Saúde e inovação: uma abordagem sistêmica das indústrias da saúde". *Cad. Saúde Pública*, pp.47-59.
- Goldberg, S. "SUS economiza com fabricação de 22 produtos no país" available at: <[http://www.sincofarma.org.br/noticias/noticiasdescricao.asp?Textos\\_ID=14058](http://www.sincofarma.org.br/noticias/noticiasdescricao.asp?Textos_ID=14058)> (Accessed on November 2010).
- Grewal, R. et al. (2008). "Counting chickens before the eggs hatch: Associating new product development portfolios with shareholder expectations in the pharmaceutical sector". *International Journal of Research in Marketing*, v.25, n.4, pp.261-272.
- Hunter J. and Stephens, S. (2010). "Is open innovation the way forward for big pharma?". *Nature Reviews Drug Discovery*, v.9, n.2, pp.87-88.
- IBGE. (2010). *Pesquisa de Inovação Tecnológica 2008*, IBGE, Rio de Janeiro, RJ.
- INTERFARMA. (2010). "Inovação e pesquisa Clínica no Brasil". *Edições Especiais Saúde*, v.II, Outubro, pp.1-23.
- Kunz, I. (2003), "Relação Universidade-Empresa: uma análise a partir da interação Unicamp-empresas no período 1996-2001", working paper, Administration School, UNICAMP University, Campinas, 25 August.
- Pereira, V (2009), "Cooperação universidade empresa: estudo dos impactos da lei de inovação sobre a parceria Petrobrás-UFRJ", working paper, Pós Graduação em Planejamento de obras, construção e montagem do trabalho, Universidade Federal Fluminense, Niterói, 13 April.
- Lee, Y. S. (2000). "The sustainability of university-industry research collaboration: an empirical assessment". *The Journal of Technology Transfer*, v.25, n.2, pp.111-133.
- Machado, J. P., et al. (2010), *Empreendedorismo no Brasil 2009*, Instituto Brasileiro da Qualidade e Produtividade (IBQP), Curitiba, PR.
- Martin, B. R. and Etzkowitz, H. (2000), "The origin and evolution of the university species", paper presented at the at the Organisation of Mode 2/Triple Helix Knowledge



Production Workshop, 20 October, Goteborg University, Sweden, available at: <http://www.sussex.ac.uk/Units/spru/publications/imprint/sewps/sewp59/sewp59.html> (Accessed on 13 May 2011)

Mattar, F. N. (1996), *Pesquisa de marketing*, Atlas, São Paulo, SP.

OECD (1996), *Technology, Productivity and Job Creation, Analytical Report*, Paris.

OECD (2005), *Manual de Oslo. Diretrizes para coleta e interpretação de dados sobre inovação*, OECD, 3rd edition, Paris.

Pereira, V (2009), "Cooperação universidade empresa: estudo dos impactos da lei de inovação sobre a parceria Petrobrás-UFRJ", working paper, Pós Graduação em Planejamento de obras, construção e montagem do trabalho, Universidade Federal Fluminense, Niterói, 13 April.

Radaelli, V (2006). "A Inovação na Indústria Farmacêutica: forças centrípetas e forças centrífugas no processo de internacionalização", working paper, Institute of Geosciences, Universidade Estadual de Campinas, Campinas, 8 May.

Rocha, M. de M. (2011). "Avaliação da parceria entre indústria farmacêutica e universidade como estratégia competitiva para a inovação de medicamentos no Brasil". Niterói, 182 f. Dissertação (Mestrado em Engenharia de Produção). Universidade Federal Fluminense, Niterói, RJ.

Rocha, M. de M., et al. (2012). "Innovation as a Critical Success Factor: an Exploratory Study about the Partnership among University with Pharmaceutical Industry in Brazil", *Journal of Technology Management & Innovation*. Vol.7, Issue 3, pp. 148-160.

Saúde, M. D. (2008), *"Política Nacional de Ciência, Tecnologia e Inovação em Saúde"*, Secretaria de Ciência Tecnologia e Insumos Estratégicos Departamento de Ciência e Tecnologia, Ministry of Health, 2ª edition, Brasília, DF.

Salomon, M. F. B. (2008). "A política de patentes na relação empresa- universidade: o caso Cristália", working paper, Production Engineering, Universidade Federal de Itajubá, Itajubá, 20 August.

Santoro, M. D. (2000), "Success breeds success: The linkage between relationship intensity and tangible outcomes in industry-university collaborative ventures", *The Journal of High Technology Management Research*, v.11, n.2, pp.255-273.

Sbragia, R., et al.(2006), *Inovação: como vencer esse desafio empresarial*, Clío Editora, São Paulo, SP.

Schumpeter, J.A.(1947), "The Creative Response in Economic History", *The Journal of Economic History*, Vol. 7, No. 2, pp. 149-159

Schwab, K. and Sala-i-Martin, X. (2010), *The Global Competitiveness Report 2010–2011*, World Economic Forum, Geneva.

Segatto, A. P. (1996). "Análise do processo de cooperação tecnológica universidade-empresa: um estudo exploratório", working paper, Economics and Business School, Universidade de São Paulo, São Paulo, 10 September.

Sennes, R. and Mendes, R. C. (2009), *Propriedade Intelectual e Inovação: Uma Análise das Principais Empresas e Universidades Brasileiras*, Prospectiva Consultoria, São Paulo, SP.

Silva, C. E. S. D. and Salomon, M. F. B. (2007). "A relação empresa-universidade como ferramenta estratégica à gestão de aprendizagem organizacional". *GEPROS. Gestão da Produção, Operações e Sistemas* v.4, n.jul-set/07, p.p. 11-22.

Stal, E. and Fujino, A. (2006), "As relações universidade-empresa no Brasil sob a ótica da Lei de Inovação". *Revista de Administração e Inovação*, v.2, n.1, pp.5-19.

Tidd, J. et al. (2008), *Gestão da inovação*, Bookman, Porto Alegre, RS.

Vieira, V. M. M. and Ohayon, P. (2008). "Inovação em fármacos e medicamentos: estado-da-arte no Brasil e políticas de P&D". *Revista Economia & Gestão*, v.6, n.13.

Yamane, H. (2009). "Comments on the Pharmaceutical Sector Inquiry Preliminary Report". *European Commission Issues Report on Pharmaceutical Sector Inquiry*, 15 Colum. J. Eur. L. Online 27, 30 January.