Triple Helix, Innovation and Technology Transfer from The Initiative of The Interested Company: Case Study of The Drug VONAU-FLASH and Its Partnership Between USP and BIOLAB SANUS PHARMACÊUTICA LTDA

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Abstract

The present work will discuss a case study of the development of the drug VONAU FLASH, focusing on the triple helix model, based on the partnership between the University of São Paulo and the laboratory BIOLAB SANUS FARMACÊUTICA LTDA. The innovation resulted from an objective initiative formulated by the interested company, which allowed the creation of the university's patent and transferred technology to the pharmaceutical company. The commercialization of the developed drug represents 90% of the royalties' revenue from the University of São Paulo, totaling approximately 3,4 million BRL per year. The laboratory projects annual earnings of nearly 165 million BRL per year with the sale of VONAU-FLASH developed with the partnership signed between the University and the company.

Keywords
Intellectual Property, Technology Transfer, Innovation.

1. Introduction

The improvement of the necessary gears for the development of innovation has become a constant and central concern of public policies in most western countries arising from Schumpeter's idea from the expression known as creative destruction (SCHUMPETER, 1942).

This expression identifies that the capitalist system evolves continuously through an internal process of constructing and deconstructing different productive models, such as a constant self-destructive and regenerative march, evidencing the essential character of product and process innovation evolution.

Aware of this scenario, the State was obliged to encourage public policies that catalyze this evolutionary process, increasing measures capable of promoting and integrating agents in the best position to develop new products and processes.

Based on successful experiences in the United States (ETZKOVITZ, 2003; DA CRUZ et al., 2014), it remains identified that state action must enable the meeting of the three principal agents responsible for innovation in a format known as the triple helix. The three vertices of this model would be composed of the government, companies, and universities' participation in a symbiosis of multiple interactions to generate an optimization of results (ETZKOVITZ, 2003).

The movements of these helixes would take place in several and continuous directions and not previously defined. The helixes' turn can be conceived based on the government's demands, as an agent responsible for implementing specific policies or inducing the innovation procedure from its purchases or projects.

It is also possible to conceive the helixes' movement based on research initiated within the university itself. The natural expertise or vocation of those responsible for research is privileged.

Likewise, the impetus for innovation may come from demands arising from the companies responsible for implementing new products on the market, which would have a better chance of seeing consumers' risks and needs, representing an increased chance of success of the enterprise.

Therefore, the initial movement that generates new products on the market would take place in the most diverse forms and ways depending on the type of technology used or the product to be developed, with no pre-defined format or models that exclude each other. It is essential to highlight the most typical models identified by (ETZKOVITZ, 2003). It is essential to highlight the most typical models identified by (ETZKOVITZ, 2003): the laissez-faire, with a predominance of industry, the statist, in which the Government predominates, and the typical triple helix in which the fundamental role is of Universities as producers of new knowledge and technologies.

Once the technology was developed in a research center, the passage from creation to the market and its identification as a product will occur through the technology transfer mechanism, signed by commercial agreements between the various parties involved (STEVENS et al., 2005). In Brazil, the number of experiences such as the described here, despite exist (Santos Júnior and Mello, 1996; Barbalho et al., 2009; Ghesti et al., 2019), is not commonly reported in scientific and indexed journals such that their mechanisms can be well known and compared to foreign experiences.

In this perspective, the present work aims to present a case study related to the development and technology transfer of the medicine entitled VONAU FLASH developed by the University of São Paulo in partnership with the company BIOLAB SANUS FARMACÊUTICA LTDA., in which the possibility of success of the triple-helix model based on specific demand and clearly defined by the company responsible for implementing the product on the market.

The beginning of the innovative process was based on a company demand, added to the commercial result of the developed business, with substantial royalties for the University of São Paulo and profits for the licensed laboratory. According to triple helix precepts, it is revealed as a path to be followed in the country, intending to reach the full potential of innovation success.

It highlights the importance of the pharmaceutical market in Brazil and the need to develop and improve the companies involved' technological capacities, which benefit the country and reduce external dependence concerning enhancing the development and production process of new products' most effective drugs (TAKAHASHI, 2005).

Thus, the present work aims to identify the nuances of the VONAU FLASH case and identify its specific characteristics compared with the triple helix model to obtain innovation suggested by companies from the transfer of technology to be developed within the scope of universities.

At first, the concepts of innovation, technology transfer, and their relationship with the triple helix model will be identified. An analysis will then be carried out on the relevance and need for closer relations between universities and companies, mainly under the focus of the origin of the demand to obtain success in innovation. Next, the VONAU

FLASH patent's technology transfer procedure will be described, emphasizing the participation of the entities involved in the triple helix vertices. Finally, considerations about the case presented will be pointed out.

2. Theoretical framework

2.1. Innovation, Technology Transfer, and Triple Helix

According to the Oslo Manual (2005), innovation is "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OCDE, 2005, p. 55).

Etzkowitz defines the triple-helix "as an innovation model in which the university/academy, the industry, and the government, as primary institutional spheres, interact to promote development through innovation and entrepreneurship" (ETZKOWITZ; ZHOU, 2017, p. 24–25).

The roles of each of the helix are the following: the university is the entity responsible for spreading knowledge, the company must adapt the innovation made by the university to an industrial scale and, finally, the government has the role of formulating policies and articulating, financing and regulating the ecosystem (ETZKOWITZ, 2003).

The starting point for the historical identification of the development model based on the idea of the triple helix stems from the appreciation of the rules established in "The Patent and Trademark Law Amendments Act," Decree known as the Bayh-Dole Act, published on December 12, 1980 (US GOVERNMENT, 2019).

The American government edited this legal instrument to regulate and standardize the financing models among government agencies, which facilitated the elaboration of an integrated and effective national public policy of technological development, in opposition to the previous pulverized and complex model of development existing in that country (DA CRUZ et al., 2014).

In summary, this Decree allowed the possibility of attributing intellectual property rights over the faculty's discoveries/creations/inventions in the universities resulting from public funding to the intellectual property nucleus (NIT) of those entities, as well as assigning the responsibility of universities in the signing of agreements for the eventual commercialization of the developed products (FELDMAN et al., 2007). The regulation's clear objective was to promote economic and technological development and increase the country's competitiveness (FELDMAN et al., 2007).

The benefits of that legislation were verified. There is an understanding that there was a healthy induction of the agents' behavior (State, university, and companies) to increase the number of patents and the development of high-technological products in the USA (LEVENSON, 2005). Barbalho, Medeiros, and Quintella (2019) indicate the evolution of the development of relations between university and company and the importance of the Bayh-Dole Act.

Frey, Tonholo e Quintella (2019) approach that through the Triple Helix, innovation becomes the result of the constant interaction between government, academy, and companies. This interaction is part of the legal framework of innovation and materializes with establishing the NITs and the SITs. SIT is the acronym for Scientific, Technological, and Innovation Institution. It is an agency or entity of the direct or indirect public administration or a private non-profit entity legally constituted under Brazilian laws. It must have headquarters and a venue in the country. Its institutional mission or its social or statutory objective must be directed to basic or applied scientific or technological research. It can also focus on the development of new products, services, or processes under the terms of item V Article 2 of Law No.10.973/2004, as amended by law No. 13.243/2016 (BRASIL, 2016).

In its turn, NIT is the acronym for Technological Innovation Nucleus, provided by item VI Article 2 of Law No. 10.973/2004 (BRASIL 2004). It is defined as a structure instituted by one or more SITs, with or without its legal personality, whose purpose is to manage institutional innovation policy and competencies the attributions foreseen in the mentioned Law nº 10.973/2004.

According to the mentioned Law nº 10.973/2004 (BRASIL 2004), the NIT is in charge of managing the transfer of technology from the ICTs (many of them housed in the academy) and facilitating their relationship with the companies.

Technology transfer is the process by which a set of knowledge, skills, and procedures applicable to production problems are transferred through economic transactions from one organization to another, expanding the recipient organization's capacity for innovation. (Barbalho, Medeiros, and Quintella, 2019).

In an approach that considers the interaction between companies and academy, technology transfer is conceptualized as "(...) a process that consists of several steps, which includes the disclosure of the invention, the patenting, the licensing, the commercial use of technology by the licensee and the perception of royalties by the university" (STEVENS et al., 2005).

The realization of technology transfer is a fundamental activity for implementing innovation in business. It is known that the improvement of companies' competitiveness is also due to the development of new technologies. Santos, Toledo, and Lotufo (2009) point out that this development is vital in a scenario of globalized competitiveness. The configuration and reconfiguration of business occur by creating new products and processes and improving production and management practices.

In the opposite direction to this movement, Santana and Porto (2009) point out that universities' bureaucracy and the lack of proactivity by the companies prevent the realization of technology transfer and the formation of strategic partnerships between universities and companies. Barbalho, Medeiros, and Quintella (2019) present cases in which the hypothesis of companies' proactivity is treated as, in fact, the lack of knowledge of these organizations, especially small ones, on how to access the knowledge produced by universities. In this sense, the authors illustrate cases of SITs in which portals for the dissemination of technologies with market potential are presented.

Technology Transfer can occur in several ways, from established by contracts signed between the parties, technology development in a confidential manner, or partnerships in open innovation spaces. The figure below shows the main forms of technology transfer.

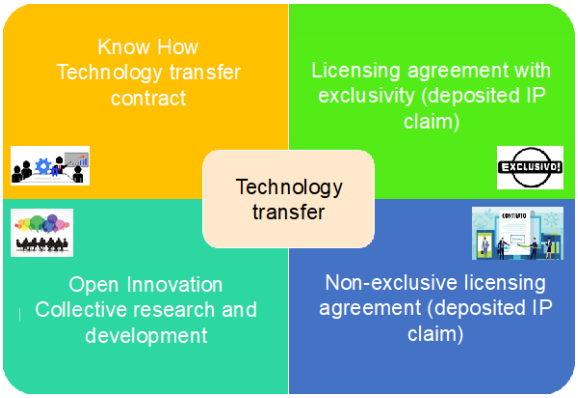

Figure 1: Primary Forms of Technology Transfer. Source: Adapted from STEVENS et al. (2005).

The university-business interaction can be achieved through technology transfer offers not only under financial benefits for both parts. The social benefit is primary since the results achieved with academic research can improve the quality of life of the population impacted by the increase and improvement of available medicines (MORAIS, 2013) and generate learning on managing innovation both in the company and in the academy.

2.2. Interaction between universities and businesses

In triple helix relationships, the government presents itself as responsible for laws and institutions, the university for research, and companies researching actual innovations. But none of these interactions can leverage innovation as much as those that occur between universities and companies, responsible for facilitating the entry of new technologies in the private sector (WONGLIMPIYARAT, 2016).

According to the Brazilian National Confederation of Industry (CNI, 2016), this relationship's greatest attention has two fundaments. The first reason stems from the growing need for technology embedded in innovations, especially

those with disruptive characteristics. The second reason is that, unlike other relationships, those between university-companies are full of nuances and are generally seen as weak, unstable, and should be encouraged.

The complexity of the interactions between government policies and relations between universities and companies can be seen in the diagram below (figure 2), created by the Organization for Economic Cooperation and Development (OECD). The relations are presented in the center like an iceberg with unstructured relationships in its base, and up to the top, the fully structured relationships. Examples of fewer structure actions are graduates' flow to the industry, informal contact with a network of professional contacts, and conferences. Some examples of structured actions are licensing and research contracts.

We can also observe government policies, to the left of Figure 2, which bring structural conditions and support regimes, such as specific regulations, concerning structural conditions and fiscal incentives when talking about support regimes.

There is a diagram in the right corner that shows the degrees of codification: the degree of possibility of transmission of knowledge, the high level being represented by scientific articles and patents. However, the former is at a low level of capturing profits with innovation, and the second has a good level of adequacy.

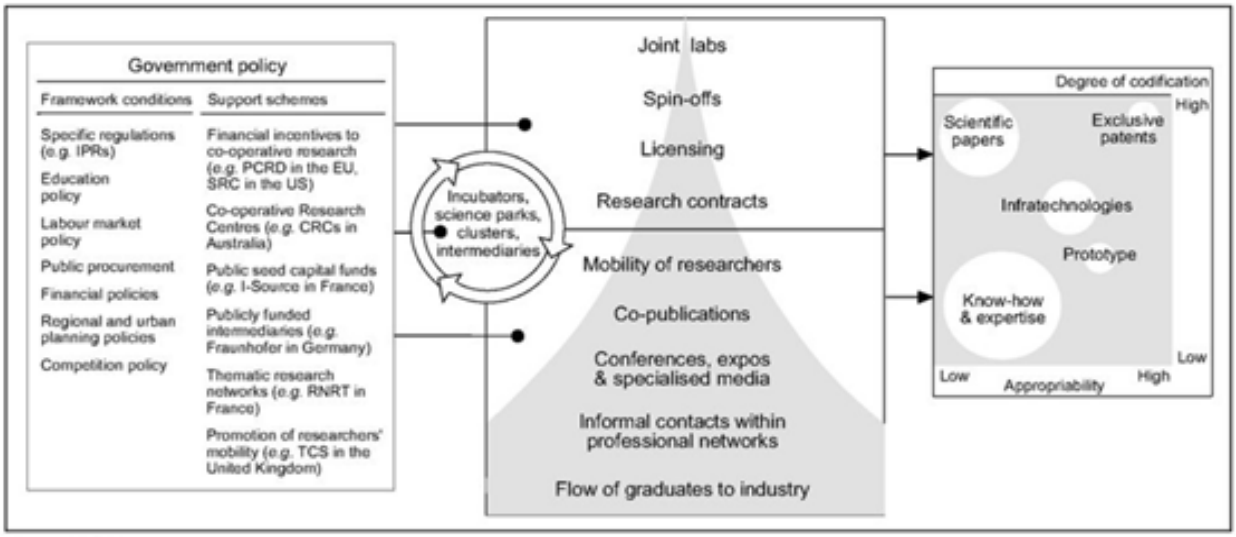

Figure 2. Formal mechanisms that might be involved in university/business interactions in research Source: OECD, 2002, p. 23.

According to Brito Cruz (2019), three types of intellectual property indicators are normally used in the interaction between the company and the university. The first is the number of patents deposited by universities. The second is the number of patents in which universities share ownership with companies. The last indicator is the percentage of patents licensed and the amount of revenue obtained through licensing.

Regarding this last percentage, the author explains a poor understanding of this subject in Brazil. The disagreement refers to the idea that in universities in the United States of America, the revenue source from licensing or co-ownership of intellectual property generates a large amount of money. However, the data from the American Association of University Technology Managers (AUTM) in 2016 shows that almost 50% of the universities that responded to the survey received less than 1% of their R&D costs as revenue from IP, and 70% from universities received up to 2% of R&D costs. Finally, it is noteworthy that only three universities (out of 164) obtained revenues above 20% of their spending on R&D, demonstrating that the patent business is not representative of a typical American university's revenues.

Concerning the reality of a Brazilian university, the example of Unicamp, considered one of the leading technology licensing universities in Brazil, is even worse. In 2015 and 2016, the amount of revenue derived from IP rights was

0.2% and 0.1%, respectively, over Unicamp's R&D budget. (Cruz. C., 2019). Literature also presents good results from high-technology companies seeded in the University of São Paulo, for example, the case reported on Burin Neto et al. (2013).

Since the Innovation Law in 2014, there has been an increasing number of implementation of NITs in Brazil. Besides, this induction policy increases the implementation of NITs and their contracted technology contracts, as we can see in Table 1.

Table 1. Technological Innovation Centers and Value of Technology Contracts from Research Institutions in Brazil - 2006-2017

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Implemented Technological Innovation Centers	19	54	75	80	94	116	141	166	180	199	208	226
Technological Innovation Centers in implementation	0	15	6	59	60	49	39	66	54	48	46	37
Technology Contracts (R$ Million)	0,8	5	13,2	67,5	191	218,6	285,3	302,7	338,5	358,35	437,86	500,2

Source: Formict (Form for Information on the Intellectual Property Policy of Scientific, Technological and Innovation Institutions in Brazil), MCTIC 2018.

Despite the clear evolution in terms of the number of technological innovation centers, the literature has called attention to the fact that the composition of them has accompanied a dynamic of compliance with the Law, and not necessarily the development of the elements of entrepreneurship and innovation that such structures should foster in Universities (Quintal; Santos and Terra, 2014). Thus, the NITs become organizations more geared towards university bureaucracy, not contributing to remedy the deficiencies in university-company relations in Brazil. Misfunctions have remained, such as the lack of trust between the parties about the results of possible jointly developed projects. In general, the company considers the university to be very slow and unrealistic; the university considers the company to be very immediate and difficult to share the positive results of an eventual partnership (Barbalho, Medeiros and Quintella, 2019).

3. Methodology

Regarding the methodology, the research adopted is of the descriptive inductive type, using qualitative approach strategies, such as bibliographic research, a modality of analysis of scientific documents (scientific articles, journals, and papers), normative, news, among others. Using the inductive method justifies describing a case study of the technology transfer relationship between the University of São Paulo and the BIOLAB SANUS FARMACÊUTICA LTDA laboratory.

The first step of the research was to conceptualize the triple-helix model and its relationship with technology transfer and innovation in the Brazilian scenario. Triple-helix was understood as the best framework for the specific case analyzed regarding the interaction between the University of São Paulo and the BIOLAB SANUS FARMACÊUTICA laboratory.

The second step of the research consisted of increasing the relations between universities and companies and the indicators generated to measure the cases of technology transfer resulting from such relationships.

The third step consisted of documentary research through content analysis (Bardin, 1979; Mozzato and Grzybovski, 2011) in its categorical variant, in which public documents related to the VONAU FLASH project, and after its commercialization, were analyzed to perform a description of the peculiarities of the technology transfer case of the drug known as VONAU FLASH resulting from the interaction between USP and the BIOLAB SANUS FARMACÊUTICA laboratory. At this point, that was a search to identify the characteristics of the interaction process between all the agents involved that may present themselves as relevant reasons or indications for the innovation process's success.

Finally, a collation of the collected information was made, such as notes for future research related to the theme of interaction between university-company-government to develop new products, emphasizing the case studied.

4. Vonau case and its specificities

USP organized its NIT in the USP Innovation Agency format to facilitate the technology transfer processes and the university's relationship with the government and companies. The USP Innovation Agency, at various times during the Vonau case innovation process, had significant participation in producing the results achieved, as described below.

The patent development that gave origin to the VONAU FLASH medication resulted from an initiative by the scientific president of the Brazilian laboratory BIOLAB SANUS FARMACÊUTICA LTDA., which identified the need to improve the drug absorption procedure to control nausea and vomiting in the Brazilian market. (COHEN, D., 2018).

The initiative resulted from the verification in medicine's foreign market with properties superior to the competing Brazilian product. According to the testimony (COHEN, D., 2018) of the scientific president of the company BIOLAB SANUS FARMACÊUTICA LTDA., Mr. Dante Alario Jr., there was a previous identification that the ZOFRAN medication, marketed in England, had a very efficient active principle and that it could be used in Brazil due to the end of the patent protection period.

The active ingredient of the aforementioned foreign medicine is ondansetron, and its commercialization is in the form of a pill for oral ingestion. Until the partnership with the University of São Paulo, there was no development of any combination that would facilitate the ingestion of Brazil's mentioned chemical compound.

The issue of facilitating the ingestion was very relevant because the method developed for the imported medication ZOFRAN, which consists of a dehydration procedure in the laboratory, had a high cost, making its replication impracticable an economic point of view (COHEN, D., 2018).

Likewise, creating a technology that accelerates the medication's absorption to control motion sickness could be configured as a product differentiator in the market and even its use for other target audiences, such as children, the elderly, and chemotherapy patients.

In this sense, ARMANDO (2018) clarifies that this oral disintegration process is used as an alternative for patients who have difficulty swallowing tablets or liquids, such as, for example, the elderly, children, or patients undergoing chemotherapy treatment. These patients may have a picture of nausea that impairs conventional pills' administration, usually performed using a glass of water and, especially, those with tumors in the oral region and esophagus.

Based on the perception that overcoming this obstacle related to the medication ingestion process's facilitation could result in a competitive advantage in the market in its respective therapeutic class, whether in terms of product price or reaching other target audiences, the company BIOLAB SANUS FARMACÊUTICA LTDA. proposed a partnership with the University of São Paulo through a professor from the Faculty of Pharmacy to solve this problem based on his research group's performance.

The research demand was directed with a certain and definite objective of proposing a solution to turn the ondansetron's active ingredient into a quickly soluble medication in patients' mouths.

This time, there was a combination of efforts between the interested company and the University, backed by an innovation program established by the government, which, at the time, made available a scientific investment fund for projects carried out through partnerships between companies and research centers, to provide a solution to a problem identified by the market representative.

In other words, the research development was based on the problem presented by a company that would be responsible for introducing the innovation to the market. It should be noted that, for holding knowledge related to the cost of producing the imported medicine that served as a paradigm for the research, the pharmaceutical company revealed

itself as the entity with the greatest capacity to start the innovation process. However, it sought the academy's research and development capacity to obtain a successful future product.

The research was carried out. The Pharmaceutical Development and Innovation Laboratory of the Faculty of Pharmaceutical Sciences of the University of São Paulo created the medication's final version (PIETRO, 2018). According to the researchers' lead professor (FERRAZ, 2018), the research resulted in a new formulation for the ondansetron hydrochloride drug, which started to be quickly absorbed by the patient orally, without the need to ingest the medicine in the form of a tablet.

The elaborated medicine quickly dissolves in the patient's mouth and prevents any rejection of the pill during the process of nausea or vomiting. At this point, the drug generated had the same capacity to produce effects concerning the reference medicine ZOFRAN, reflecting the enterprise's success and its respective effectiveness in reaching the proposed objectives.

According to ARMANDO (2018), the VONAU FLASH produced by BIOLAB SANUS FARMACÊUTICA LTDA. can be considered bioequivalent (same speed and extent of absorption of the active ingredient) to the product ZOFRAN. For that, these products can be administered interchangeably, without prejudice to the therapeutic effect. The product was launched on the market in 2005 after the patent was filed with the National Institute of Intellectual Property carried out on 01/09/2004, under the application number PI 0403668-9 B1 (INPI, 2019).

According to the National Institute of Intellectual Property analysis, the invention provided a solution to the problem related to the use of aspartame to enable the rapid oral disintegration of medicines. It has a special application to mask the bitter taste of ondansetron hydrochloride. Consequently, the technology allowed the full configuration of the requirement of patentability related to the inventive activity under the terms of Article13 of the Industrial Property Law (Law No. 9.279/96).

The patent letter of the invention was issued on 03/13/2018. It is noteworthy that since the provisional marketing authorization started in 2005, the product VONAU FLASH has presented itself as a sales success (PIMENTEL et al., 2019), which has led to assuming the hegemonic position in its segment. This success led the competing laboratory HYPERA SA to file for a patent nullity request to the National Institute of Intellectual Property (FONTES, S., 2019).

The National Institute of Intellectual Property defined the controversy under the Technical Report's terms dated 07/31/2019 (INPI, 2019). The National Institute of Intellectual Property confirmed the understanding that the patent's technical problem would consist of obtaining a solid composition of rapid oral disintegration capable of masking the unpleasant taste of assets. The solution presented in the patent suggested an increase in the amount of aspartame and super disintegrant in the drug's formula.

According to the INPI, this proposed solution would not follow in any obvious way from the state of the existing technique, from an analysis of the state of the closest technique configured in the records, and from the objective technical problem established.

The drug developed from the patent, entitled VONAU FLASH, has become one of the most emblematic and important cases in Brazil of the valuable relationship between all the agents involved in the technological development model outlined by the idea of the triple helix. It is verified in the fact that the patent for the drug VONAU FLASH is the one that until 2018 generated the most royalty payments to the University of São Paulo (PIETRO, B., 2018).

The technology transfer developed at the university and transferred to the company BIOLAB SANUS FARMACÊUTICA LTDA. through a licensing agreement, creates the obligation that the company pays a percentage of sales in the form of royalties to the developing university.

The royalties of VONAU FLASH represent approximately 90% of the total of R$ 3.4 (three million and four hundred thousand reais) of the exploration contracts developed and signed within the scope of the University of São Paulo, according to data for the year 2018 (INVESTE SÃO PAULO, 2018). This volume of resources reinforces the

partnership's success and indicates a potential path to be observed in other cases involving innovation in the area of medications.

5. Discussions

Regarding the case study treated in this article, one of the success factors in the technology transfer process was the study's convergence with the interest of the BIOLAB SANUS FARMACÊUTICA LTDA laboratory. It corroborates the statement reported above, in which the executives point out the need to adapt the objectives of university research to the demands of companies.

It is observed that the research was planned from the beginning under a perspective of a future technology transfer. It reduces one of the barriers pointed out by scholars as an obstacle to introducing products on the market that comes from research developed in universities (BLANCH et. al., 2014) that would be the search for the commercial partner.

In other words, the research of the VONAU FLASH case has already been traced from the beginning with the real perspective that there would be a future transfer of the developed knowledge to a company that would be responsible for introducing innovation in the market. This path points to a reduction in the risk of frustration and failure of the enterprise.

The company's previous relationship also allowed the developed patent to be strong enough to support lawsuits that questioned the product's own patentability, which was fundamental for the developed business model. The presentation of cases like Vonau Flash demonstrates the different ways to transfer technology through successful products developed at universities. In this case, the starting point was a scientific project in which the research group developed a product based on the demand of a company, but with financial resources from funding programs in which the government invests in projects that are carried out through a partnership between a company and a university research center.

This case is different, for example, from the case described in Ghesti, Martin, and Barbalho (2018). The scientific development carried out in applied chemistry was transformed into a product through a startup company created by the students involved in the research. It also differs from open innovation relationships, as described in Chesbrough (2003), in which companies directly finance research carried out at universities. Therefore, the concrete case presented here presents another type of university-company relationship that occurs in the Brazilian innovation ecosystem, with positive results as described here.

6. Concluding Remarks

The technology transfer between the University of São Paulo, through its Technological Innovation Center – NIT (it's an acronym in Portuguese) and BIOLAB SANUS FARMACÊUTICA LTDA stem from the creation and development of the patent that resulted in the medicine known as VONAU FLASH. Vonau represents an emblematic case of the existing partnership model between university-company by promoting mechanisms created by the State.

The partnership between the laboratory and the University, based on Law No. 10,973 / 2004, allowed the use of the labs and the staff linked to the University to fulfill research requested by a private laboratory, that resulted in the creation of a new medicine with great penetration in the Brazilian market. The University of São Paulo started to receive a high volume of resources from the royalties obtained by the developed drug's sales. The company BIOLAB SANUS FARMACÊUTICA LTDA outperformed competitors in the created drug segment, which revealed that the innovation developed was crucial to acquiring a differential concerning those already existing.

In this scenario, it is possible to affirm that the university-company partnership's innovation represented a kind of "destruction" of the models of medicines previously sold. The new drug has the new functionality for nausea and vomiting control medicine, which is the medicine's fast oral absorption that facilitated the takeover of a hegemonic position in the medical segment. Consequently, the research was initiated in response to a clear and objective demand formulated by the company representatives. The result culminated in a clear view of what the company truly wanted and increased the enterprise's chances of success. (COHEN, D., 2018).

This reasoning derives from the idea that, among the triple helix's entities, companies can better evaluate the possible return on investment or even present indicators that the invention to be developed has an effective and practical impact and can effectively enter the market.

The company has better conditions to evaluate the market and specify production costs. It also has an interest in verifying the gaps to be filled to obtain a competitive advantage in its competitors' face. In this way, in a Schumpeterian view, the company would be the entity ablest to promote "creative destruction" or lead the innovation process. In this sense, the triple helix model, capable of generating technological development, appears to have a greater chance of success when the initiative originally took place through demand from an interested company itself.

The case analyzed innovation had better conditions to enter the market effectively and generate dividends for the university that developed the research and the interested company, and the inventor himself. The analysis of similar cases in the future may serve as a support for proving the idea presented and reinforcing the need to establish new mechanisms or initiatives that encourage companies to propose research projects in partnership with Brazilian universities. The presentation of successful cases allows building a wealth of good practices that boost the work processes of universities, companies, and government agencies whose purpose is to reinforce the development of innovative business models in Brazil.

The research's main limitation is that it is based on a single case, analyzed in detail. Another limitation is that there was no possibility of conducting interviews with those responsible for the initiative presented here, which implies no triangulation of the research data. Future research could address these limitations.

References

Armando, Y. P. Avaliação da bioequivalência entre comprimido convencional e comprimido de desintegração oral contendo 8 mg de ondansetrona. Tese de Mestrado: Fac. de Ciên. Farm. Universidade de São Paulo (2018).

Barbalho, S.C.M.; Amaral, D.C.; Kernbichler, T.S.; Richter, E.H.; Torres, L. Rompendo obstáculos para a implantação de escritório de projetos em empresa de base tecnológica. *Gestão & Produção*, v. 16, p. 435-449 (2009).

Barbalho, S. C. M.; Quintella, C. M.; Medeiros, J. C. C. (Org.). O marco legal de Ciência, Tecnologia e Inovação (CT&I) e seu potencial impacto na inovação no Brasil. 1. ed. Curitiba: CRV Editora, 1. 236 p. (2019).

Bardin, L. Análise de conteúdo. Trad. de Luís Antero Reto e Augusto Pinheiro. Portugal, Lisboa: Edições 70, 1979.

Blanch L.; Guerra L.; Lanuza A. Innovation and technology transfer in the health sciences: A cross-sectional perspective. Medicina Intensiva, p. 492-497 (2014).

Brasil. Lei 10.973, de 02 de dezembro de 2004. Diário Oficial [da] República Federativa do Brasil, Brasília, DF, 03.12.2004. http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/lei/l10.973.htm. Acesso: 26 out. 2019.

Brasil. Lei 13.243, de 11 de janeiro de 2016. Diário Oficial [da] República Federativa do Brasil, Brasília, DF, 11 jan. 2016. http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2016/lei/l13243.htm. Acesso em: 26 out. 2019.

Brasil. Propriedade Intelectual das Instituições Científicas e Tecnológicas do Brasil. Relatório Formict 2018. Ministério da Ciência Tecnologia e Inovação Brasília, 2018.

Burin Neto, F et al. Gestão de portfólio de produtos: práticas adotadas por uma empresa de base tecnológica de médio porte localizada na cidade de São Carlos/SP. *GEPROS: Gestão da Produção, Operações e Sistemas*, v. 8, p. 67-78, 2013.

Chesbrough, H. W. Open Innovation: The New Imperative for Creating and Profiting from Technology, Harvard Business School Press (2003).

CNI. Destaques de Inovação - Inovação: o papel da cooperação universidade-empresa, CNI, Brasília (2016).

Cohen, D.; Santos, M.; Toledo, P. Um remédio para a universidade. Revista Exame, São Paulo, p.71-73 (2018).

Cruz, C. H. B. Benchmarking university/industry research collaboration in Brazil. In: REYNOLDS, E.; SCHNEIDER, B.; Zykberberg, E. (Ed.). Innovation in Brazil: Advancing Development in the 21st Century. Nova York: Routledge Studies In Innovation, Organizations, And Technology, p. 120-143 (2019).

Da Cruz, H. N. B.; De Souza, R. F. Sistema Nacional de Inovação e a Lei da Inovação: Análise comparativa entre o BayH-Dole Act e a Lei de Inovação Tecnológica. Rev. de Adm. e Inovação - RAI, v. 11, n. 4, p. 329-357 (2014).

Da Cruz, H.; De Souza, R. F. Sistema Nacional de Inovação e a Lei de Inovação: Análise comparativa entre o Bayh-Dole Act e a Lei de Inovação Tecnológica. Rev. de Adm. e Inovação – RAI, v. 11, n. 4, p. 329-357 (2014).

Etzkowitz, H. Innovation in innovation: the triple helix of university-industry-government relations. Social Science Information, 42(3), 293-337 (2003).

Etzkowitz, H. e Zhou, C. Hélice Tríplice: inovação e empreendedorismo universidade-indústria-governo. São Paulo: Universidade de São Paulo, v. 31 (2017).

Feldman, M. P.; Colaianni, A.; Liu. CK Lessons form the comercialization of the Cohen-Boyer patentes: The Stanford University Licensing Program. In: Intelllectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices Oxford. (2007).

Ferraz, H. A universidade não sabe o que fazer com suas patentes. Valor Econômico. São Paulo (2018).

Fontes, S. Patente do vonau flash fica com Biolab e USP. Valor Econômico. São Paulo, 2019. Disponível em: https://valor.globo.com/empresas/noticia/2019/09/05/patente-do-vonau-flash-fica-com-biolab-e-usp.ghtml

Frey, I. A.; Tonholo, J.; Quintella, C. M. (orgs.) PROFNIT: Conceitos e Aplicações de Transferência de Tecnologia – Vol. I. IFBA. Salvador – BA (2019).

Ghesti, G. F.; Martin, A. R.; Barbalho, S. C. M. Innovation habitats from University of Brasilia - case study of Macofren - Chemical Technologies startup. Product Management & Development, v. 16, p. 134-140 (2018).

Levenson, D. Consequences of the Bayh-Dole Act. Cambridge. MIT, 2005. Disponível em: http://web.mit.edu/lawclub/www/Bayh-Dole%20Act.pdf

Lotufo, R. A. (orgs.). Transferência de Tecnologia: Estratégias para estruturação e gestão dos Núcleos de Inovação Tecnológica. Komedi. Campinas – SP (2009).

MINISTÉRIO DA CIÊNCIA TECNOLOGIA E INOVAÇÃO. A Gestão da Propriedade Intelectual nas Instituições de Fomento à Ciência, Tecnologia e Inovação. p. 1–62, 2013. Disponível em: http://dit.ufsc.br/files/2013/09/POLITICA-DE-PI-DO-MCTI.pdf.

Morais, R. Modelos de Fomento e P&D em Farmacêuticos e Benchmarking Internacional. Texto para Discussão (IPEA. Brasília), v. 1825, p. 1 (2013).

Mozzato, A. R.; grzybovski, D. Análise de Conteúdo como Técnica de Análise de Dados Qualitativos no Campo da Administração: Potencial e Desafios. RAC, Curitiba, v. 15, n. 4, pp. 731-747 (2011).

OCDE. Benchmarking Industry-Science Relationships. Paris: OCDE, 2002. Accessible: https://books.google.com.br/books?id=8ZXWAgAAQBAJ&pg=PA6&lpg=PA6&dq=benchmarking+industry-science+relationships&source=bl&ots=e04GEF_XyL&sig=ACfU3U13lVF1HfpzV31QE4C7FRBkTpagTA&hl=pt-BR&sa=X&ved=2ahUKEwjIob22yPDnAhWFHbkGHefNCYo4ChDoATAFegQIChAB#v=onepage&q=benchmarking%20industry-science%20relationships&f=false

OCDE. Manual de Oslo: Diretrizes para a Coleta e Interpretação de dados sobre Inovação Tecnológica. Rio de Janeiro: FINEP, 2005. Disponível em: http://www.oecd-ilibrary.org/science-and-technology/manual-de-oslo_9789264065659-es.

Pietro, B. Relações com o setor produtivo. Revista Pesquisa Fapesp, São paulo, 2018. Disponível em : https://revistapesquisa.fapesp.br/2018/07/10/relacoes-com-o-setor-produtivo/

Pimentel, D.; Rosso, G.; Delgado, L. Ciência empreendedora que transforma. Mit Sloan Review (2019).

Quintal, R.S.; Santos, B.R.C.; Terra, S.R. Políticas organizacionais de ciência, tecnologia e inovação e gestão da propriedade industrial: Uma análise comparativa em instituições de pesquisa. Gestao e Produção, 21(4), 760-780 (2014).

Santos Júnior, D.; Mello, R. Experiências em desenvolvimento de produtos em empresas pioneiras do pólo tecnológico de São Carlos. Gestão & Produção, v.3, n.1, p. 86-99 (1996).

Santana, E. E. P.; Porto, G. S. E agora, o que fazer com essa tecnologia? Um estudo multiuso sobre as possibilidades de transferência de tecnologia na USP-RP. RAC, Curitiba, v. 13, n. 3, art. 4, p. 410-429 (2009).

Schumpeter, Joseph Alois (1942). Capitalismo, socialismo e democracia. Rio de Janeiro: Zahar Ed. (1984).

Stevens, A., Toneguzzo, F., Bostrom, D. AUTM US licensing survey: FY 2004. Association of University Technology Managers. (2005). <http://www.immagic.com/eLibrary/ARCHIVES/GENERAL/AUTM_US/A051216S.pdf>. Last accessed 2019/05/15.

Takahashi, Vania Passarini. Transferência de Conhecimento Tecnológico: Estudo de Múltiplos Casos na Indústria Farmacêutica. Revista Gestão & Produção, v. 12, p. 255-269, (2005).

Tavares, Hiago. Ecossistemas de Inovação e Análise de Redes: uma análise dos projetos de Inovação da Região Metropolitana de Curitiba Innovation ecosystems and network analysis. São Paulo: ENANPUR (2017).

US GOVERNMENT. Disponível em https://www.govinfo.gov/content/pkg/STATUTE-94/pdf/STATUTE-94-Pg3015.pdf/. Disponível em: novembro, 2019.

Wonglimpiyarat, Jarune. The innovation Incubator, University Business Incubator and Technology Transfer Strategy: The case of Thailand. Technology in Society, 46, p. 18-27 (2016).

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