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APLICAÇÃO DE UM MODELO DE PROCESSO PARA
A GESTÃO DA PROPRIEDADE INTELECTUAL
EM UM ESCRITÓRIO DE LICENCIAMENTO DE
TECNOLOGIA DE UM CENTRO DE PESQUISA
BRASILEIRO

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Abstract: In Brazil, the Technology Licensing Office (TLO) are responsible for managing the innovation policy of Scientific and Technological Institutions (STI). However, when analyzing the functioning of the TLO is possible to observe that these are organizations that still require capacitation to perform with efficiency and efficacy of its functions. Thus, the aim of this paper is to report the application of a model for the management of Intellectual Property (IP) in the TLO of the Instituto Nacional de Pesquisas Espaciais (INPE-TLO), in Brazil, which was conducted through an action research. The application of such a model is intended to empower INPE-TLO to perform its functions relating to the protection and commercialization of technologies in order to promote the transfer of technologies created by research and development units of the INPE to the productive sector. As preliminary results, it is possible to highlight the development of an action plan to realignment the flow of activities as well as to customize the model proposed to culture and INPE-TLO structure.

Keywords: Technological Innovation, Intellectual Property, Technology Protection, Technology Commercialization, Technology Transfer.

Resumo: No Brasil, o Escritório de Licenciamento de Tecnologia (TLO) é responsável pelo gerenciamento da política de inovação das Instituições Científicas e Tecnológicas (STI). No entanto, ao analisar o funcionamento do TLO é possível observar que estas são organizações que ainda necessitam de capacitação para atuar com eficiência e eficácia de suas funções. Assim, o objetivo deste artigo é relatar a aplicação de um modelo para a gestão da Propriedade Intelectual (PI) no TLO do Instituto Nacional de Pesquisas Espaciais (INPE-TLO), no Brasil, que foi realizado através de uma pesquisa-ação. A aplicação de tal modelo pretende capacitar o INPE-TLO para desempenhar suas funções relativas à proteção e comercialização de tecnologias, a fim de promover a transferência de tecnologias criadas por unidades de pesquisa e desenvolvimento do INPE para o setor produtivo. Como resultados preliminares, é possível destacar o desenvolvimento

de um plano de ação para realinhar o fluxo de atividades, bem como customizar o modelo proposto para a cultura e a estrutura do INPE-TLO.

Palavras-chave: Inovação Tecnológica, Propriedade Intelectual, Proteção de Tecnologia, Comercialização de Tecnologia, Transferência de Tecnologia.

INTRODUCTION

In Brazil, to manage innovation in a Scientific and Technological Institution (STI), were created the Technological Licensing Office (TLO). The Law of Innovation (Law 10,973/2004 amended by Law 13243/2016), according to Brasil (2016; 2004), determines that each STI should have a TLO, own or in association with other STI, to manage its innovation policy. This law also determines the minimum competences of an TLO: I) ensure the maintenance of the institutional policy to encourage the protection of creations, licensing, innovation and other forms of technology transfer; II) to evaluate and classify the results of research activities and projects; III) evaluating independent inventor's request for invention adoption; IV) to opine for the convenience and to promote the protection of the creations developed in the institution; V) to express an opinion on the convenience of disclosure of the creations developed in the institution, subject to intellectual protection; VI) monitor the processing of applications and the maintenance of the institution's IP charter; VII) to develop studies of technological prospecting and competitive intelligence in the field of intellectual property, in order to guide the actions of innovation of the STI; VIII) to develop studies and strategies for the transfer of innovation generated by STI; IX) to promote and monitor the STI relationship with companies; And X) negotiate and manage technology transfer agreements from STI.

However, even with the minimum competencies defined by the Innovation Law, an analysis of the functioning of the TLO reveals that these are bodies that still need to develop their organizational skills to improve their activities and/or functions and thus achieve their goals, that is, to manage the STI innovation policy. This assertion is corroborated by Chimendes (2011), who describes that some STI have TLO that do not function properly, and by Coelho and Dias (2016), who describe that while TLO are perceived as a legal obligation, the impact of the Innovation Law will be smaller than, indeed, could come to be.

Thus, Buchele et al. (2015) and Dias and Porto (2013) describe that the performance of TLO occurs in a constantly changing environment and that stimulating and supporting the innovation process is still a challenge. In turn, the application of good management practices, with the effective use of methods, techniques and tools is fundamental to support the process of managing innovation, efficiently and effectively.

This need for a review of the way TLO works is what justifies this study.

Thus, this article aims to present the application of a model for the management of intellectual property in the TLO of the Instituto Nacional de Pesquisas Espaciais (INPE-TLO), in order to develop

its organizational capacities, especially with regard to Management of INPE's innovation policy.

It is worth mentioning that, according to Klumb and Hoffmann (2016), in the last decades, Brazilian public organizations have evolved in terms of innovation, both in services provided to society and in their internal processes.

To develop this work, an action-research methodology was performed in the INPE-TLO, in Brazil, the STI of the aerospace area.

The action research was performed and supported by a literature review, conducting research in relevant books and periodicals on technological innovation and intellectual property.

Along the duration of the action research, there was direct contact and continuous with all the professionals of the TLO studied and the researchers of the INPE. This action research was conducted over three months.

This article is structured in 5 parts. The second presents a review of the literature on intellectual property management, the third presents the proposed model for the management of intellectual property in TLO, the fourth describes the implementation of this model in INPE-TLO and finally, the fifth reports the main conclusions about this research.

Intellectual Property Management in a Technological Licensing Office PI, according to WIPO (2015) and INPI (2014), refers to the legal branch dealing with legal protection granted to all creations of the human mind, such as inventions, literary and

artistic works, symbols, names and images used with Purpose. Santos (2011) describes IP as a topic that has gradually been growing in importance in private organizations that seek both to use it for marketing purposes and to guarantee a competitive position in the globalized economy, and also in public organizations, especially in STI, which are increasingly faced with a new reality, composed of processes of technology transfer and innovation.

For Amadei and Torkomian (2009), the strengthening of policies relating to IP in a STI directly impacts the protection activities of the technologies at the same time enables the transfer of technology to the productive sector. Still, based on Bérard (2014), Toledo et al. (2011) and Tigre and Marques (2009), the IP system is a legal mechanism that seeks to ensure the protection of technology, innovation and, consequently, economic development, given the risks and difficulties faced by innovators.

These authors also indicate that this mechanism is characterized by high complexity due to the interaction, comprehensiveness and variation among its various elements, generating dynamic forces that are often opposite. All this makes IP management a broad and complex issue.

In this same sense, Mais et al. (2009) and

Moreira (2007) describe that with the promulgation of the Innovation Law, there has been a significant advance in the proposals for instruments and formal means of interaction between STI and companies, including

the elimination of restrictions for STI to exploit Technologies developed, as a result of the results of their research.

Until then, this relationship happened informally, hampering the conversion of knowledge into innovation and long-term partnerships.

Contextualizing, the relationship between STI and other organizations can, among other possibilities, be as follows: STI develop technologies and wish to transfer them to organizations that will use these technologies to generate innovation.

On the other hand, public and private organizations increasingly need the knowledge and technologies to innovate their processes and products or services, in search of competitiveness or obtain competitive advantages, as previously described.

Thus, it is necessary to encourage, establish and strengthen the relationship between STI and public or private organizations, in order to boost the transfer of technology. Thus, according to Caerteling, Halman and Dorée (2008), this positive relationship between STI and the productive sector can be encouraged or benefited by C,T&I policies through governments, thus operating the triple helix approach.

Santos (2009) states that in Brazil, in recent years, have intensified the interest in IP rights and STI-company cooperation, but the process of knowledge generation and transformation of this knowledge into wealth is in the embryonic stage.

The country currently has an academic system with increasing level of performance and excellence in many areas of knowledge and an entrepreneurial base able to accelerate the spread and introduction of technical progress, which would allow reducing the existing gap between STI and companies. For this to occur, according to Jannuzi et al. (2008), legal instruments to stimulate innovation still need to be better worked so that the intellectual creations generated from STI become technological innovations.

In this context, for Conley, Bican and Ernest (2013), Shahraki (2012), Germeraad (2010), Jannuzi et al. (2008), O'Hearn (2008), Chesbrough (2007), Jain and Sharma (2006), Vives I Gràcia (2005) and Feldman et al. (2002), one of the challenges for TLO is to use multiple mechanisms to delineate strategic decisions for IP management, taking into account the STI innovation strategy.

This will allow you to succeed in managing the portfolio of technologies. In this perspective, defining the organizational processes that will allow the protection and commercialization of the creations generated in the scope of the STI is fundamental to guarantee the efficiency and effectiveness in the management of the IP.

Protection of Technologies

It is the protection, in its proper format, that will guarantee the appropriation of the technology created, making STI benefit from the R&D activities. In the same sense, Pinheiro (2012) and Chen and Wang (2010) indicate that protection is one of the basic premises to guarantee the rights of commercialization and transference of the technology

created, and for Silva e Silva (2013), the protection of technologies walks Side by side with innovation.

Legal protection is provided through IP protection instruments that are identified as Copyright, Industrial Property and Sui Generis Protection.

According in Jungmann e Bonetti (2010), copyright focuses on subjective character of interests, because basically reflects the authorship of intellectual works in the literary, scientific and artistic field, examples of which are: drawings, paintings, sculptures, books, conferences, scientific articles, music, movies, photographs, software, among others, being regulated in Brazil by Law No. 9.610 / 98.

The industrial property has as its object patents and utility models, trademarks, industrial designs, geographical indications, trade secrets and unfair competition repression, being regulated by Law No. 9,279 / 96.

The sui generis protection involves the topography of integrated circuit, to cultivate, as well as traditional knowledge and access to genetic resources, each type of protection regulated by specific legislation, which are, respectively, Law No. 11,484 / 2007, Law No. 9,456 / 97 and Decree 4,946 / 2003.

Reinforcing the point of view described above, considering Spivey, Munson and Wurth (2014) and Gonzalez-Gelvez (2013), protecting the technologies created is a fundamental action for STI. To accomplish this protection, it is necessary for TLO managers to devote time to formulating strategies to make the best decision on the format of protection most appropriate for each technology.

Thus, the formulation of strategies for the appropriation of technologies, adapted from Carneiro (2007), depends on the organizational capacities of TLO, the external environment and institutions with which TLO interacts.

Thus, protection is a factor that directly impacts the commercialization and transfer of technologies, as already seen previously. The type or form of protection, including the markets where the technology is protected, can make the technology more attractive to an organization, depending on the competitive advantage that protection represents. Thus, considering Ritter Junior (2015) and Kelm et al. (2014), developed technologies should be protected in the way that is most appropriate for STI without ignoring issues related to the promotion of innovation. Thus, strategies for protection and commercialization must be integrated in order to transform the opportunity offered by a new technology into a competitive advantage.

According to Arora and Ceccagnoli (2006), a strong protection strategy translates into greater reward in the commercialization of technology and for Bezerra (2010), the protection of technologies presents itself as a way to make technological innovation feasible, among other possibilities.

Commercialization of Technologies

In order to promote the transfer of a technology, it is necessary to establish a set of activities for the commercialization of the protected

technologies contained in the portfolio of a TLO, considering the elaboration of strategies to seek out to potential organizations interested in the technology created, to offer the technology to these Organizations and negotiate the transfer of this technology.

For Hernández et al. (1990), Chimendes (2011) and Sine, Shane and Di Gregorio (2003), the commercialization of technologies generated by STI is an economic phenomenon, since it is a way of generating value, including social value. In this way, technology marketing activities are of fundamental importance in a TLO, since there is no way to carry out a technology transfer without first negotiating.

The commercialization of technology, according to Bandarian (2007) and Shane (2002), involves a set of skills to negotiate the transfer of a technology from one STI to another organization, and also considering Lichtenthaler (2011b), Haeussler (2008)), Chesbrough (2007) and Teece, Pisano, and Shuen (2000), to commercialize a technology is a strategic issue that is linked to the competitive forces of an STI.

Likewise, since there is no single format for protecting technologies, there is no single way to commercialize a technology. According to Jungmann and Bonetti (2010) and Rocha, Sluszz and Campos (2009), from an analysis of information about the assets or assets of IP, that is, about the technologies, and also about the interests of the STI, it is possible to define the most appropriate mode of availability, which may consider: making licensing or franchise agreements; sell the goods to another company or transfer know-how; create spin-off or start-up and joint ventures; encouraging business incubation or setting up a specific purpose company, cross-licensing to gain access to partner technology; partner with P, D & I, use their IP asset to attract investment, among other possibilities.

Based on these two previous paragraphs and considering Archila (2015), Kotha, George and Srikanth (2013), Mohan (2012) and DongHyun et al. (2007), it is possible to conclude that the technology commercialization process requires a reliable method of assessing the commercial potential of incoming technology in TLO, including, according to Barbieri and Álvares (2005), technology trade, as is the case of IP, it is hardly similar to the trade in tangible goods, including those incorporating new technologies such as machinery, equipment and productive inputs. It is a business that takes place in a highly asymmetric market, in which the buyer does not know what he is actually buying.

Therefore, it is normal that the negotiations follow at a slower pace than the businesses involving known goods and services. In this case, the reputation of the sales organization is a factor that facilitates negotiations.

In this way, according to Granstrand and Holgersson (2013), Abbasi, Attar, and Hajihoseini (2012), Buenstorf and Geissler (2012), Ziedonis (2007) and Sung, Gibson and Kang (2003), the commercialization of protected technology is not a Trivial activity, but rather a complex activity, which should receive the appropriate emphasis by the STI, in particular by the TLO. It is a much more complex activity than simply analyzing the clauses of a contract, as in most Brazilian TLO.

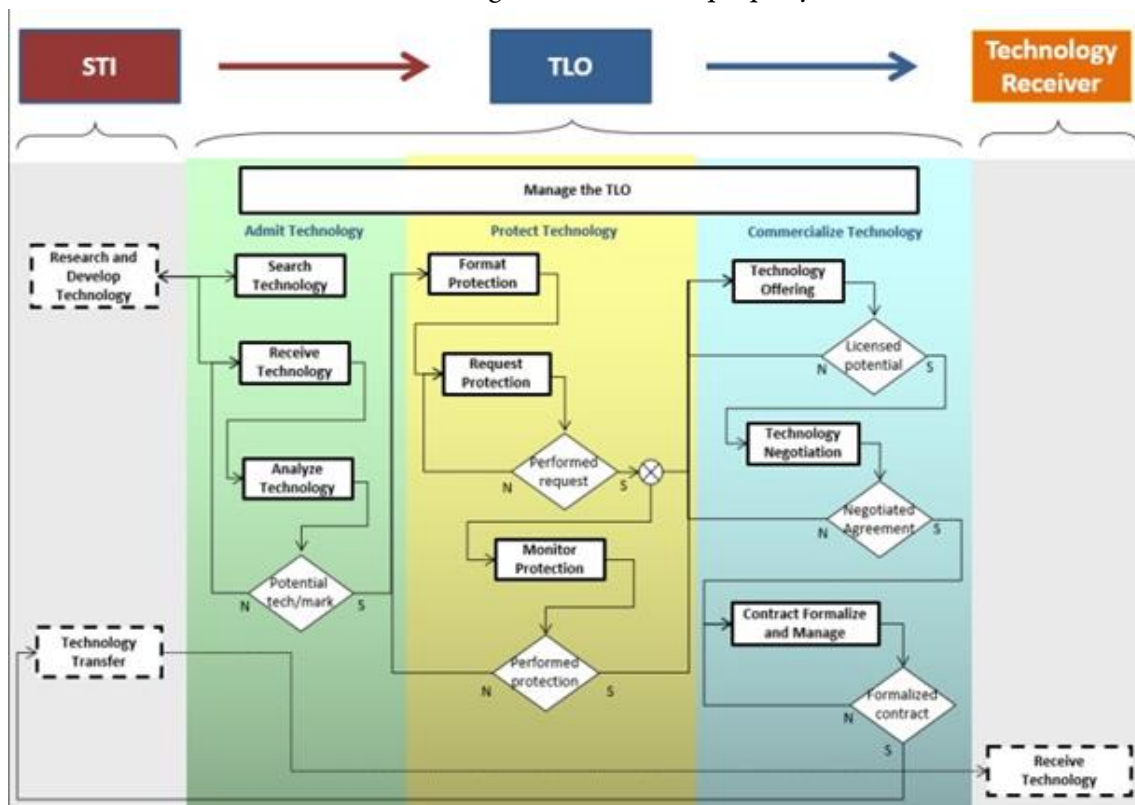
Considering this complexity, Barboza (2011) and Lichtenthaler (2011b) describe that an important approach to the management of IP in an TLO and at the same time a major challenge is the elaboration and achievement of a strategy and the definition of mechanisms actively implemented for the Commercialization of technologies. In other words, it is necessary to identify the opportunities to market the technologies, to plan and to take actions, instead of simply waiting for the potential receivers of the technology to come in contact.

Model for the Management of Intellectual Property in a Technological Licensing Office

Considering the issues dealt with in the literature review, it is possible to understand that it is necessary to review the way in which TLO operate, with regard to the management of intellectual property.

Thus, in Figure 1, according Andrade (2016) a model for the management of intellectual property in TLO is presented.

Fig. 1
Process model to manage the intellectual property in a TLO.



The dynamics of this macroprocess, presented in Figure 1, considers that an STI, in its R & D activities, invents or creates a technology, and with that, it communicates the invention /creation to the TLO. TLO receives the communication of the invention/creation, checks if the information is correct and performs an analysis of the technology, evaluating its technical aspects, to identify the technical potential of the technology and the feasibility of legal protection, as well as the market, With a view to identifying market potential and potential interested in

the technology developed. If there is technical and market potential, the technology is sent for protection. If the technical or market potential of the technology is low, STI should be communicated for the continuity of research or development, in an attempt to provide the technology with innovative aspects or that meet the market demand.

For those technologies that present high technical and market potential and considering the definitions of the technology analysis, the type of protection that will be most viable for the technology, that is, the one capable of increasing the value of the technology and to facilitate its transfer to another organization. Once the protection has been formatted, one must request protection (eg, if it is a patent, the patent application is filed). Once the request for protection has been made, this request will be monitored until it is carried out and, after its completion, to guarantee the maintenance of the protection.

Following the request for protection, the offer of the technology, based on the recommendations of the technology analysis, should be initiated until a potential interested is found. By finding an interested potential, the contractual issues related to technology transfer (eg contractual clauses, form of payment, etc.) will be negotiated. If there is an agreement between the parties, then the contract between the STI and the technology receiver must be formalized. The process of formalization of the technology transfer contract must be carried out with the legal advisory of STI.

In this model there is the formulation of strategies in all processes. There is no single defined strategy for all technologies, except for their evaluation and follow-up of a previously defined process. Strategies are formulated and defined according to the technical and market potential of each technology, that is, for each technology, a different strategy must be formulated, which requires dynamic process capability. According to Hall (2014), each of the technologies developed by an STI has its own opportunities and threats, due to its dynamic nature, and it is therefore a challenge to introduce them to the market. Considering Santos and Belderrain (2014) it is possible to affirm that every environment that involves the formulation of strategies can be considered complex, because it is surrounded by uncertainties, due to the multiple internal and external actors involved in decision making and that impact the environment in Strategies will be applied.

The subprocess Analyze Technology is critical within this model, since it is from the analysis performed in this subprocess that all the strategies of the other subprocesses are formulated. According to Arora and Ceccagnoli (2006), decisions about the protection and commercialization of technologies must be taken at the same time. Therefore, this subprocess can be considered as critical in this structure, and in this context, it is important that it be executed with high efficiency and effectiveness, to allow reliable information to elaborate the strategies of the other subprocesses.

To implement this model, it is necessary to use tools or management tools appropriate to each phase of the macroprocess. Considering

Carvalho (2014) initiatives and actions for the management of IP must be in processes, which contain clearly established routines, to carry out a robust and sustainable cycle. Still, based on Lichtenthaler's (2011a) point of view, IP management processes should not be simplified. On the contrary, to be successful, you need to create active processes with a strategic focus that have a vision that is turned out of the STI. This is important, given the dynamics and complexity involved in processes related to IP management.

This process model create capabilities to make the TLO more proactive and dynamic, and so, to make the TLO capable of assessing technologies that are forwarded to the TLO, and only then, make decisions, and define strategies for the protection and commercialize of technologies.

Application of the Proposed Model in the Technology Licensing Office from the Instituto Nacional de Pesquisas Espaciais

INPE-TLO manages a portfolio of 25 technologies appropriate for the Intellectual Property (IP) regime, of high impact in the space sector, including many of them with the possibility of application in other sectors of the economy (dual application technologies).

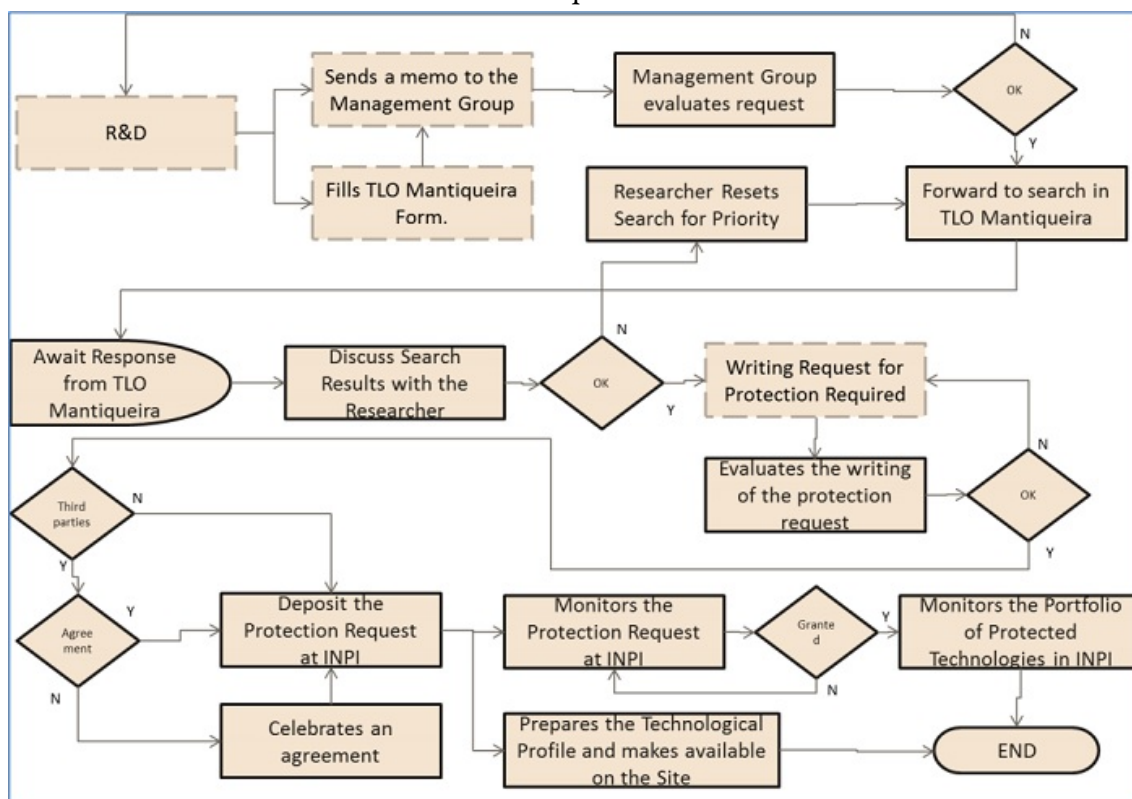
However, the commercialization of these technologies by TLO, and its consequent transfer, is less than desired or expected for a large and renowned STI, such as INPE. In other words, the technologies developed have not become innovation. However, this does not mean that INPE does not transfer technology or generate innovation, rather, many technologies are generated and transferred successfully. This concerns only technologies that are protected, commercialized and transferred under the IP regime. It is worth mentioning that, according to Tres and Ferreti (2015), PI can play an important role in the development of a nation and, according to Bahia and Sampaio (2015) a concise system of intellectual property protection encourages invention and technological progress.

INPE-TLO is also responsible for other activities related to the management of INPE's innovation policy, not just the management of intellectual property. Among other activities, it is incumbent upon INPE-TLO: to stimulate institutional capacity-building in the management of technological innovation; Identify supply and demand of technologies through interactions and partnerships with universities, technology parks, companies and society; Prospect mechanisms of financial support, as well as partnerships and agreements, to develop projects of institutional interest; Stimulate the productive sector to participate in joint projects of technological training; Develop mechanisms to monitor and control the agreements; and, to manage the institutional training program committee. Currently, these activities are partially performed and only operationally and on demand, without a strategic conception.

However, in order to manage INPE's innovation policy, INPE-TLO should act proactively and strategically. For this to occur, as Silva (2016), Vieira and Quadros (2016), Froehlich and Bitencourt (2015) and Panizzon et al. (2015), it is necessary to mobilize, adapt, renew, reconfigure or recreate the resources and promote organizational changes

in the TLO, leveraging its dynamic capabilities, which involve a set of organizational skills that, in order to adapt to dynamic environments, seeks to establish a set of processes that act on its resources, generating the TLO renewal capacity. In this sense, Machado Junior, Mazzali and Palmisano (2015) describe that organizations need to establish adequate organizational structures to meet the demand for management of innovation processes.

Fig. 2
Flowchart of PI activities performed in INPE-TLO.



Summarizing the process flow, shown in Figure 2: the researcher of a research and development unit of INPE develops a technology and, by identifying potential in this technology for protection or transfer, this researcher sends a memorandum to INPE-TLO requesting that the technology be protected, through one of the protection modalities through IP (patent, software registration, etc.). INPE-TLO receives such request and conducts a previous search to assess if it is possible to request protection. Once this possibility is confirmed, INPE-TLO begins to write the application for protection, together with the researcher and after finishing the writing, deposit the application for protection at the Instituto Nacional de Propriedade Intelectual (INPI), in Brazil. Once deposited, INPE-TLO starts to monitor the payment of annuities and the INPI requests. The technology is included in the portfolio of technology and INPE-TLO is waiting for a potential interested to negotiate the transfer of technology. It is noted, therefore, that a completely passive role

is adopted and no strategies are defined for each of the technologies that enter INPE-TLO.

Regarding their structure, were indicated by the INPE-TLO team, among others, the following opportunities for improvement:

- Strengthen the interaction of TLO with INPE research units;
- Follow the projects developed at INPE; # Create a model to evaluate technologies before protection;
- Create an active process of technology commercialization;
- Follow the process of technology transfer
- Establish adequate indicators on the operation of the TLO and on innovation in the INPE;
- Transforming the performance of TLO: from a bureaucratic role to a strategic one. Considering the model of processes for the management of intellectual property presented in Chapter 3, and comparing it with the activities currently carried out by INPE-TLO, its strengths and weaknesses, a plan of actions was created, considering also, The affinities of each of the members of the TLO, with proposals for improvements, in order that INPE-TLO will start to carry out its activities, according to the provided in the presented model, customizing it to INPETLO.

In this sense, Dias and Porto (2013) describe that the introduction of a model of good management practices should consider external and internal variables, such as environmental factors, legal framework, organizational management, human resources management and business strategy.

With the implementation of the actions foreseen in the proposed action plan, it is considered that it was possible to contribute by introducing new approaches, methods, techniques and tools that promote the strengthening of INPE-TLO ability to manage INPE innovation policy, whereas, according Cassol et al (2016), management practices are able to drive innovation in organizations.

Final Considerations

This article presented a model for the management of intellectual property in TLO and the description of its application in INPE-TLO. Also covered issues related to the development of organizational capabilities of INPE-TLO for the management of INPE's innovation policy.

To be successful in protecting and commercializing technologies, based in IP, it is necessary that the process may be designed in a proactive environment and organizational conditions that are favorable or conducive to generate or establish strategies that allow increasing success in the protection and in the commercialization of the technologies developed by a STI, promoting technology transfer and innovation.

The research is ongoing, as well as the implementation of the actions defined in the plan developed for the application of the model. In this way, it is suggested for future work, to detail the application of the model, as well as the necessary changes in the TLO structure.

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