Processes Proposal for the Intellectual Property Protection Management in a Technology Licensing Office from a Brazilian Scientific and Technological Institution

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***Abstract*--In Brazil, in recent years, the Intellectual Property (IP) rights and cooperation between Scientific and Technological Institution (STI) and company have intensified interest, despite the process of knowledge generation and transformation of this knowledge into innovation and wealth be in an embryonic stage. The IP concerns the branch of law, which deals with the legal protection granted to all human mind creations, such as inventions, for example. Legal protection technologies according to IP rights, as well as the management of these protected technologies in an STI, is the responsibility of Technological Licensing Office (TLO). One of the challenges encountered by TLO is concerning the management of IP to use multiple mechanisms to shape decisions for the protection of new technologies, considering the TLO innovation strategy. From this perspective, to define the organizational processes that will enable the protection of generated creations under the TLO, it is essential to ensure efficiency and effectiveness in the IP management. Thus, the aim of this paper is to present a process model for the technologies protection based on IP, contained in the a TLO portfolio, as a way of leveraging technologies transferred, invented or developed by STI to a receiving organization.**

I. INTRODUCTION

In Brazil, most research is done by Scientific and Technological Institution (STI). A STI is a [6] agency or entity of public administration, whose institutional mission, among others, is to perform basic or applied research activities of a scientific or technological nature (i.e.: research centers and universities). However, there is a distance between the STIs and the companies, which hinders the access of companies to technologies created or developed by STIs. Therefore, it is difficult to transfer the technologies developed by STIs to companies. Thus, in order to improve the interaction between the STI and the companies, it was created, according [6], the law 10.973, known as Innovation Law.

The Innovation Law requires that each STI disposes of a Technological Licensing Office (TLO), with the aim of managing policies of innovation from the STI, including questions related to intellectual property (IP). The intellectual property (IP), according [24] and [45], regards the branch of law that deals with the legal protection granted to all creations of the human mind, such as: inventions, literary and artistic works, symbols, names and images used for commercial purposes. The IP is divided into three categories: industrial property, copyright and sui generis protection, as will be further detailed in item 2. Reference [37] describes that the IP is a theme that is gradually gaining prominence in private organizations, seeking as much use it with marketing purposes, such as: to ensure a competitive position in the global economy, and also in public, especially in STIs, which increasingly encounter a new reality composed of technology and innovation transfer processes.

In this sense, [36] affirms that in Brazil, in recent years, it has been intensified interest in dealing with rights of IP and cooperation between STI-companies, even though the process of generating knowledge and transforming that knowledge into wealth is in an 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 the STIs and the companies.

In order to happen that, according to [26], the legal instruments to stimulate innovation, should be further worked for the intellectual creations generated from STIs may be converted in technological innovations.

Another issue that has a significant impact on protecting the technologies created by STI's and also on their transfer to companies, according [33], is the low connection between research developed by STI with the interests of the organizations, which make up the productive sector in exploring the technology. Exemplifying: the STIs develop technologies that are sometimes not aligned with market needs, mainly because many STIs do not aim to serve the market itself, but meet a specific customer, and some of the technologies are developed as a by-product of an specific project, with the feature of dual use. Thus, the developed "by-products" technologies are stored in the portfolios of the TLO. Thus, it is necessary to develop processes to promote technology transfer to the productive sector, and thus to promote innovation.

Thus, the TLO should assume a role of mediator between the STI and the companies, in this case, for negotiations involving matters relating to IP. For [11], [13], [19], [22], [25], [26], [32], [38] and [43] one of the challenges for the TLO is to use multiple mechanisms to outline strategic

decisions for the management of IP, considering the STI innovation strategy. This will allow to succeed in management of technologies portfolio. From this perspective, to define the organizational processes that will enable the protection and commercialization of creations generated in the framework of STI, is essential to ensure efficiency and effectiveness in the management of IP.

Thus, the aim of this paper is to present a process model to manage the protection of technologies based on IP, contained in the portfolio of a TLO that manage IP of a STI of the defense area, as a way of leveraging the transfer of technologies invented or developed by STI to a receiving organization. This process model has been successfully implemented in this STI.

To achieve this goal, an action research in a TLO of a large and prestigious Brazilian STI, of the defense area, was performed and supported by a literature review, conducting research in relevant books and periodicals on technological innovation and intellectual property, notably relating to the subject protection and technology transfer. In addition to the literature review, was also carried out visits in 6 different TLO from different STI. During these visits, benchmarking techniques were applied to identify the activities that each TLO played on the management of protection technologies, and their respective results. Along the duration of action research, there was direct contact and continuous with all TLO professionals studied, the researchers said STI, and professionals from other six TLO. As the process model and associated tools were developed that they were applied to the TLO in question. The result of the application was discussed with the team of professionals that TLO, to direct improvements to be made. After the improvements, the new application was made and the cycle continued until it reached a level considered adequate. Thus, the model has been completely applied to ten (10) technologies and partly in over 46 (forty-six). This action research was conducted over two years.

Whereas the duties and responsibilities as well as the activities carried out by TLO vary according to the STI, in the case of the STI under analysis, the TLO functions aim to protect and market the resulting technologies from research and development projects (R&D) that are not considered strategic in to support technology transfer to the productive sector. The management of R&D and innovation management is carried out by other STI departments, without the direct participation of the TLO.

Evaluating the activities performed by this TLO, it was obse rved that it was a set of bureaucratic tasks, with no ability to make decisions on the need to protect a technology, the type of protection, the market potential of each technology, as well other issues of strategic nature.

In a sector like TLO, which handles with complex issues, decision-making is a relevant aspect and should be aligned with the corporate strategy and innovation of the STI. Specifically regarding the protection of technology, these decisions should take into account the potential of technology to become an innovation, and the markets where this technology will be more attractive. Thus, only then it is possible to define the best way for their protection, that is, a protection that adds value to the technology and facilitate the commercialization and transfer.

This article is structured in four parts, including this introduction. The second concerns the review of the literature that deals with the technology protection concepts. The third presents the technology protection process proposed, and finally, the fourth part presents the final considerations of this study.

II. PROTECTION TECHNOLOGY BASED ON IP

According [14], from the moment when the nations were recognizing the economical importance of applied knowledge in a technology, and mainly because they perceive that market were not ruled only by the competition among prices, but also by the competition between creations or inventions that were transformed into innovations, it was stablished the search for ways to ensure the ownership of such knowledge or technologies. However, the great question was: how to ensure the ownership over an immaterial good, which it is not possible to restrict either the use or the disclosure?

This question points to the need and the importance of protecting the technologies developed by a STI. It is the protection, in its proper format that will ensure ownership of the created technology, making the STI to take advantage of the benefits arising from the R & D activities. At this moment [10], and [34] indicate that protection is one of the basic assumptions to ensure the marketing rights of established technology, and for [39] technology protection goes hand in hand with innovation.

Thus, according to [14], the solution was the concept of the extension property, originally created for tangible assets on the intellectual manifestations. However, this extension took place without the proper analysis of mismatches generated by this type of appropriation. In this context, to ensure profit from the production and marketing of intellectual property, monopoly rights over these assets were created. However, the protection of intangible assets was not able to exist on its own. That is, it needed the support of a supreme and sovereign authority to guarantee compliance with the rules within a delimited territorial space. Thus, the State was responsible for creating and legitimate rights IP.

Such an statement shows the need to assess what are the markets where the technology developed must be protected, because it is not enough to protect the technology only in the market where it was created. After all, the market for use or manufacture may be other, then it is necessary to adequately characterize the market, and only then, to decide on what would be the viable markets, where to protect technology. This review has positive implications on marketing issues of technology.

Also, before you start formatting protection, it is necessary to perform analysis related to technical issues related to the technology created or developed, and to the marketing aspects of such technology.

Reference [18] corroborate such a statement and describes that the technology needs to be understood in detail, including its purpose and the problems that it is intended to solve, the possible applications, the identification of the differential in relation to other existing technologies, among other issues.

Still [27], describe that to protect a technology, another important aspect is the definition of its ownership. In other words is necessary to define who really is the owner of the intangible asset. In this same aspect, as [20] pointed out, joint research with other organizations should be regulated through contractual agreements, which should describe how the technologies will be appropriated, marketed and/or used, protecting, thus, the rights of IP. This definition is important because, as [29] and [31] discussed, like every right to property, the IP is exclusive, that is, excluding third party use and enjoyment of the right of the object, guaranteeing exclusivity and the control of these to the right holder.

These evaluations indicated in the above paragraphs, among others, are important to direct the strategies and instruments for the protection of technologies. Reference [12] indicate that the TLO is an organization, whose function is to make such assessments.

Thus, the results of such assessments will subsidize the TLO for choosing the most appropriate instrument for the protection of technology. Legal protection is obtained through protection of IP instruments, which are identified as Copyright, Industrial Property and Protection Sui Generis.

According to [27], 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. Such forms of protection ensures its owner (rightholder) the exclusivity: manufacturing, marketing, import, use, sale and transfer.

Furthermore, adapting de [2], [5] and [27], the same technology could have various types of protection, covering different aspects by the use of appropriate instruments IP, depending on the different protection strategies. Using different options for protection ensures a competitive edge even stronger. References [7] and [15] reinforce this point, indicating that different mechanisms, namely the terms of protection, affect the marketing opportunities of technology, particularly with respect to the value of the business transaction. However, this will depend on the strategy used by STI, because not always a STI protects a technology with marketing purpose. There is no single strategy for all technologies to be protected, and not all technologies will be protected by patent. For example, for each technology, one must study what is the best protection format, verifying the need of STI, which may include confidentiality (eg. Trade secret), as in the case of a military STI, which may develop sensitive technologies (sensitive technologies, according to [30], are those which are maintained out of access by a particular country or group of countries, because of unsafety reasons, and they can then be protected by trade secret). Other approach considers to include protections to ensure a share of the market for the organization that adopts any given technology (eg. patent). Also, it may be that the same technology can have more than one type of protection format (eg. Utility model patent and trademark registration). Also, it can be that a technology can be divided into parts, so that protection is formatted for each part individually. Thus, in the context of diverse protection alternatives, the strategy for the protection of technology should be defined on the basis of assessments, performed preliminarily, as previously described.

Further reinforcing this issue, considering [23] and [40], to protect the created technologies is a key action for a STI. However, in order to make this protection, it is necessary that managers of the TLO devote more time to the formulation of strategies designed to make the best decision about the format of the most suitable protection for each technology. Thus, the formulation of strategies for the appropriation of technologies, adapting [8], depends on the organizational capabilities of the TLO, the external environment, and the institutions that the TLO interacts.

Considering [26], models for the protection of technology and appropriation of knowledge, vary according to each STI. For instance, while some opt for patent protection only when there is a partner to exploit the patented technology, others decide protect all technologies created or invented indiscriminately.

An appropriate strategy would be the establishment of a partnership of the TLO with the productive sector since the beginning of the R & D project. Thus, such partnership would facilitate the transfer of technology to society. In this case, it is important to note that the IP clauses should be carefully designed to enable adequate protection, and to prevent patents that are marketing locking mechanisms to the partner of the productive sector. However, a large part of the created technologies is academic research results, whose market introduction cannot be predicted because of technology maturity. Therefore, it is necessary to define a strategy, which it is sufficiently well designed to protect and to add value to the STI portfolio, which includes technology with different level of readiness to go to the market, and also that includes

technology that are created through partnership projects with other organizations, or that are results of academic research.

Thus, according to [1], a very sensitive element of the protection of technology through the IP, is the use which will be given to the technology. Thus, a business model should be developed for this technology, with the purpose of supporting the development of strategies for protection, and subsequent commercialization of this technology. In the context of this paper, it will only be discussed matters relating to the protection of technologies. After all, once it is known how technology can be used or applied, it is easier to develop such strategies. To that end, [17] describe that technology, its business models, and the IP management strategies do emerge as three inextricably linked dimensions. Any change in one of these three strategic dimensions has implications for the two others. Considering and adapting from [41], a business model will articulate and demonstrate the logic of how the TLO and the STI intend to create value, with the technology, whose IP must be managed taking into account its stakeholders. Reference [2] point out that a business model consists of the following elements: market segments interested in the technology; value proposition to customers/ potential recipients of technology; cost structure; revenue generation; distribution channels; strategic partnerships and organization's position, namely of the STI, in the value chain; and competitive strategy. According to [44], due to continuous changes in the IP system, new business models are emerging, challenging the policies and practices already established. These models aim to increase the efficiency and effectiveness in the management of the IP in a TLO.

Thus, considering the possible business models to be adopted, the chosen protection format will impact directly in the marketing process of technologies, as well as in its transfer process to other organizations. Making an allusion to [3] and [20], efficiency and effectiveness in protecting a technology do increase the propensity or success to commercialize it.

Another point of great relevance in this context is the monitoring of protected technologies, since the violation of IP rights is a huge matter of concern to the holders of the protected technology. [27] emphasize that to avoid losses, STI must be careful to manage the protection of their IP assets through periodic assessment, in order to identify possible unfair competition. To define the best mechanisms to ensure compliance with the law, by a third party, reduces or limits the amount of law violations in the protected IP, ensuring to the organization the due benefit or return generated by that intangible assets. Complementing to [9], the problem of unauthorized use of a technology is significant and growing, and the implementation of actions to curb counterfeiting is still a problem for organizations. This situation points to the need to establish mechanisms for monitoring the protected technologies, in order to assess whether there is misuse of technologies in protected markets, or even in other markets. So that, TLO can take steps to rectify the situation. Such monitoring could also be used to seek technologies that are already more modern that the ones protected by the STI, and thus feed back into the process of commercialization of technologies, and also the R & D processes.

Still, considering this question of the violation of IP rights, you can reinforce the need for a proper analysis of the created technologies, and design a business model to use, and only then develop strategies for their protection, because according to [4] and [42], a strong technology protection hampers its imitation and generates economic benefits for its holder. Still, in this sense, as [4] points out, the protection will be considered weak in conditions in which knowledge is easily disseminated and easily accessible, and will be considered as strong as it is higher the difficulty of imitation.

Finally, from the literature review it can be said that the protection is a factor that directly impacts the marketing and transfer of technology. The type or form of protection, including the markets where technology is protected, can make the technology attractive for a given organization, due to the competitive advantage that this protection brings with it. Thus, considering [28] and [35], developed technologies should be secured in the manner that is most appropriate to STI, without ignoring the issues related to the promotion of innovation. It is therefore necessary that the strategies for marketing and protection are integrated in order to transform the opportunity that new technology offers into competitive advantage. According to [3], a strong protection strategy translates into a greater reward in the commercialization of technology. And for [4], protection of technologies is presented as a way to facilitate technological innovation, among other possibilities.

III. PROPOSAL FOR A PROCESS MODEL FOR TECHNOLOGY PROTECTION BASED ON IP

This proposal was conceived by performing an action research that was conducted on a TLO of a Brazilian STI, as described in the introduction of this paper. This STI is a military institution that has as a mission “to increase the knowledge and develop scientific-technological solutions to strengthen the aeroespacial power, using teaching, research, development and specialized technical services, at the aeroespacial field” [16]

Briefly, it was performed a diagnosis of the flow of activities for protecting technologies at the TLO, as a first step of this action research, are described below:

- A researcher at a STI (or an independent inventor) invented and developed a technology. If this STI had an interest in protecting it and in taking it to the market, it communicated this invention to the TLO, in an appropriate form;
- When the statement of invention is received by the TLO, it evaluates the technical issues related to the type of intellectual protection (eg.: if meets the criteria for the type of protection required);

- When it was possible to protect the invention (technology), TLO could hire an office to draft the application for intellectual property protection, or could do this essay with internal resources, and submit the application for protection to the protective body (in Brazil, the INPI);
- TLO was responsible to makes the control of the "requirements" and the remuneration to be paid;
- The technology was incorporated into the portfolio of the TLO technologies and is available to companies interested in its licensing.

Note, therefore, that this TLO has not a proactive role. In this context, this TLO had 86 technologies protected under the law of intellectual property, and no transferred. This does not mean that this STI do not transfer technology. However, it means that there was a stock of appropriated technologies, through IP, that this TLO has not able to market or to transfer, probably, according by [21], because of lack of adequate processes. This is a situation similar to that of much of the TLO currently in operation in Brazilian STI.

To reverse this situation, as seen in Section 2, it is necessary to provide the TLO with well-defined processes and tools capable of assessing technologies that are forwarded to the TLO, and only then, make decisions, and define strategies for the protection of technologies.

Therefore, utilizing the research action methodology, it was developed a process, called as Organizational Process for Technology Protection composed of activities, and tools that create capabilities to make the TLO more proactive and dynamic. This process consists of three so-called sub process: Format Protection, Protective request and Monitor Protection. The representation of this process is shown in Figure 1.

In the following sub-items, this subprocess will be better described.

This process model was successfully implemented on TLO of this STI. Thus, it was possible to identify, accurately, the characteristics of each new technology subject to the TLO for protection and thus develop the most appropriate strategy for their protection. As a result, the TLO from this STI commercialized its first technology, ie promoted the first transfer technology.

A. Subprocess Format Protection

This sub-process is to identify the best form of protection (Invention Patent, Utility Model Patent, Industrial Design Registration Computer Program registration, Trademark, Industrial secret or other more complex forms of protection, or a combination of them) and format protection.

The definition of protection technology is to identify the most appropriate mechanisms and instruments for the protection of technology and must comply with the following steps:

- Verifying the technology as to complete the questions below:
  - the technology to be protected (which object (s) to be protected (s));
  - the novelty of the invention or technology (the technology is out of the current state of the art);
  - the Technology Application fields (which are the most important applications for the technology);
  - the potential markets for the technology must be protected (in which geographic markets technology will be protected);
  - The choice of form (s) of protection to be adopted (s) for the technology, which adds more value to the technology, both strategic and commercial, taking into account one or more applications (which types of protection will be applied to technology? What is the strategy for the implementation of each type of protection); and
  - Make sure the application of the confidentiality arrangements and nature for the protection of technology, as appropriate (Is there any interest in relation to such a kind of technology to national security? Is it from a classified project?).

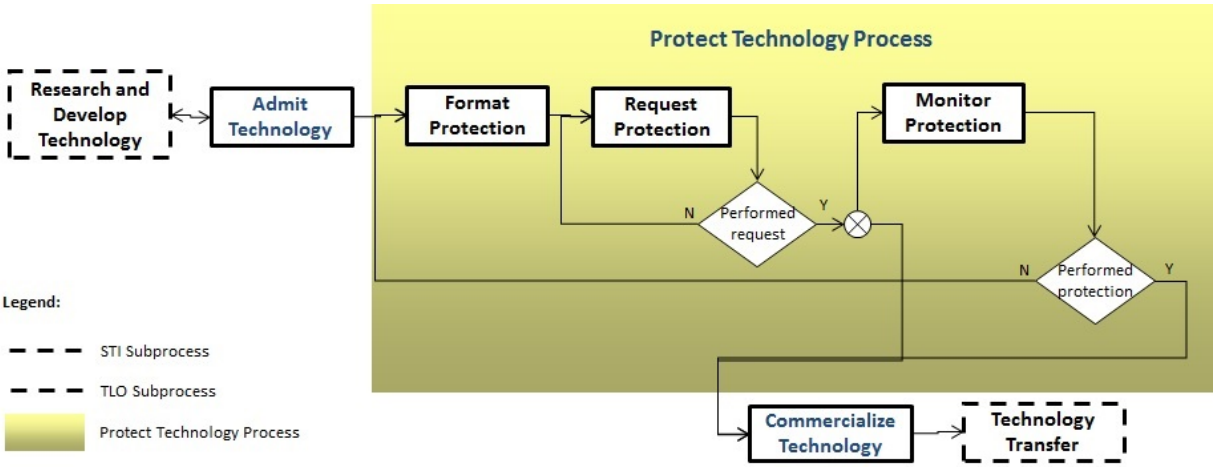

Figure 1: Protect Technology Process

- Prepare a preliminary report about the findings / recommendations above.
- Form a Technology Review Commission to deliberate on how and technology protection strategy; and submit the preliminary report to the Commission, with the conclusions / recommendations on the proposed forms and technology protection strategies.
- Develop a Protection Technical Report about the Technology, based on the resolutions presented by the Committee. The technical report should be sent to higher authorities of the TLO for approval of protection strategy indicated by the review committee. If one of these does not approve, the strategy must be cleared the reasons for failure and convened the committee for further deliberation. This should be done until the approval of the responsible for the TLO.
- After the adoption of the strategy by the data TLO, proceed with the formatting of protection within the terms of the legal system or industrial secrecy, set. Formatting protection consists primarily of:
  - Perform the technical interview, in person, with the inventor responsible for detail and supplement the information about the invention, consisting of understanding, identification and contextualization of data and technical and scientific evidence in relation to the knowledge area and the industrial scope;
  - Review the searches of prior (search subsidiary of the prior art) in bank publications, journals, research papers and banks of national and international patents, tutorials and platforms, public and/or private;
  - Lift all the data and information, grouping and ordering them by the criterion of technological relevance, according to the degree and affinity with the area of knowledge and the industrial scope of the proposed technology; and
  - Provide the wording of the technical report of protection, following the contained in Law No. 9,279 of 14/05/1996 and updates, as well as the INPI Normative Act No. 127 of 03.05.1997 and related resolutions, and others that deal with the matter, comprising: a descriptive / Attachments report, claims, drawings or figures, and abstract. All versions protection technical report will be made available to the inventor responsible for checking, correction or suggestion to final acceptance.

This sub-process is justified by the decision on the strategy to be adopted for technology protection and the protection of the adopted format (eg .: drafting the patent application). The items in this sub-process are of fundamental importance because the strategies and decisions set forth herein, and the quality with which these are performed, influence the potential value added to the invented or created technology. With the end of this sub-process, it is gone, theoretically, to the sub process Protection Request.

B. Subprocess Request Protection

This sub process is to call for the protection of technology, in accordance with the provisions of the preceding sub-process (Format Protection), the competent body (eg .: INPI, STI source technology - in the case of trade secret, or other) and ensure that the request was rejected.

In knowledge protection processes, techniques and inventions, attention should be paid to providing for the laws and regulations on the subject, so that it is ensured in a shortest possible time, the privilege of rights, production and / or marketing in selected markets. Protection may be held in the form of statutory or industrial secrets.

- Legal Board:
  - Fill the documents provided and petitions for each type of protection given as guidance and current guidelines of the relevant government agencies in Brazil or abroad.
  - Place the protective order of filing in the competent public agency, for intellectual property protection in potential markets, as the strategy.
  - Notify the holder to STI and the official responsible for commercialization of the technology that the protection of deposit request was filed, after publication of the act in the Journal of Industrial Property (RPI), in Brazil, or other applicable instrument, abroad.
- Industrial Secret
  - the request to higher levels of STI holds that protective measures be taken to the type trade secret, recommending the need to hold a meeting with all personnel involved, directly or indirectly, with technology, including other institutions or companies, if the case.
  - the elaborate an action plan, preferably using 5W1H model to be effective protection through trade secret, endowed with institutional organic character of actions to ensure that the process of obtaining and developing the technology remains confidential, in other words do not be revealed to unauthorized third party. Such an action plan should be submitted to the higher authorities of STI holds. The action plan should contain:

- Protection measures to be adopted from the start of research and development, related institutions or companies who had access, knowledge or participated in the works, with their respective members (servers / employees) and some knowledge, technical and affections sensitive data to technology;
- The fate of electronic documents generated during the research / development;
- The way of processing data and information between the parties involved; and
- Control measures for the continuity of work in the STI owner / institution / company, who use such knowledge.

- the Meet the coach of protection and the action plan approved on a one-way (paper and electronic media format does not rewritable) report, by conditioning them in a sealed double envelope, dated and signed, with the seal by the creators of technology, TLO manager and responsible (higher court) by the holder of STI technology. Save and keep the envelope in a closed safety device, safe type, or other appropriate under the jurisdiction of the TLO, indefinitely, and may also be hired for such specialized service.
- controlling the compliance with the action plan, by issuing periodic reports until all actions are completed indicated this plan, for the custody and maintenance of confidentiality of data and sensitive information.
- ***the TLO notify the STI holder*** and the official responsible for commercialization of the technology that protection actions by industrial secret have been completed, according to the action plan drawn up.

This sub-process is the implementation of the protection strategy defined and formatted in the Format sub-process protection. End of this sub-process takes place theoretically for the sub process Monitor Protection.

C. Subprocess Monitor Protection

This sub-process is to monitor the progress of the application of protection, until its consummation, and after that, until the end of its term of validity.

After the publication of the deposit protection by the statutory or completed all protection activities through trade secret, it is recommended to monitor and to control the process, in order to ensure compliance with all legal and administrative requirements for the realization protection as appropriate. The monitoring of protection may be realized in the form of statutory or industrial secrets.

- Legal Board
  - Monitor and extract information from official publications, the competent bodies, weekly, referring to the protection application processes to the grant.
  - Provide compliance with formal requirements and / or technical and file petition with the competent government bodies, if applicable.
  - Provide the manifestation and / or use of the technical report and file petition in public agencies, if applicable.
  - Provide the payments corresponding to repayments due within the ordinary deadlines, as appropriate.
  - Conduct annual surveys to identify the unauthorized use of technology, especially in markets where the technology has been protected.
  - Conduct the annual surveys, along the lines of prior art searches, to identify protection technologies similar to the protected technology, in order to compare the benefits of these technologies, feeding well, the case concerning the commercialization of technologies.
- Industrial Secret
  - Plan and conduct annually investigations / audits in STI holds and institutions / companies involved, in order to assess the efficiency and effectiveness of the actions foreseen in the action plan to maintain protection technology. Apply corrective measures or fitness for STI holds, according to the findings in the audits, if irregularities are found in any of the institutions or companies involved.
  - Check every six months, the integrity of the envelope containing the formatting protection technology, guarded security device on the responsibility of the TLO. If irregularities are found, immediately notify the TLO manager, to adopt investigative actions of the occurrence and the necessary safeguard measures.
  - Conduct the annual surveys on the use of technology protected by national and international companies. In case there is the use of technology without the permission of the owner, you must take action to safeguard the rights to the technology.
  - Conduct the annual surveys, along the lines of prior art searches, to identify protection technologies similar to the protected technology, in order to compare the benefits of these technologies, feeding well, the case concerning the commercialization of technologies.
  - With regard to actions to safeguard the rights to the technology in cases where it is found that the technology is being used without the permission of STI holder, the TLO should, through its legal counsel, notify the company / institution which is infringing IP rights and request an end to the use of technology immediately. Legal action can be taken to guarantee the rights of the owner / holder. Specifically in cases of protection via trade secret, actions must be planned in order to verify how the company / institution had access to technology, before notification.

This sub-process is similar to a process of controlling, in which case, has three different objectives: 1) Monitor the appropriation of technology, started in the previous sub-process, 2) Monitor the misuse of proprietary technology by third parties, and 3) Monitor the creation or invention of similar technologies, and its use. These three elements are important for proper management of the portfolio of technologies in a TLO. This is an ongoing process that provides information to feed the Technology protection process in itself, as well as activities related to the commercialization of technologies.

IV. FINAL CONSIDERATIONS

The TLO is an organ linked to an STI, whose main mission is the management of IP, and thus plays, among others, a role of great importance regarding the

appropriation of technologies generated by research or technological development of STI, in other words, the protection of the technologies.

Below there are presented two important reasons to protect the technologies created by a STI:

- Don't let the technology fall into the public domain and ensure market reserve, in order to prevent third parties not authorized to use the technology developed; and,
- Enables the negotiation of technology with companies or other organizations interested in using in order to promote the transfer of technology.

To be successful in protecting technologies, considering the above reasons, it is necessary that the process of protection technologies, based on IP, in a STI, may be designed in a proactive environment and organizational conditions that are favorable or conducive to generate strategies that allow increasing success in the protection of the technologies developed by a STI. In such context, TLO aims at protecting technologies, while promoting its transfer to the productive sector, and thus promoting innovation. So in this article, it is presented a process model for the Intellectual Property Protection performed in a technology Licensing Office (TLO), which allows you to view and analyze the characteristics of the technology developed by a STI, and only then, trace the strategies for their protection. Such strategies should provide the aggregation of potential value to technology.

REFERENCES

[1] Al-Aali, A. and D. Teece, "Towards the (strategic) management of intellectual property retrospective and prospective," *California Management Review*, vol. 55, n. 4, pp. 15-30, 2013.

[2] Almeida, M. F. L., J. T. Barreto Junior and M. N. Frota, "Regime de apropriabilidade e apropriação econômica de resultados de P&D: o caso de uma empresa concessionária de energia elétrica," in *paper apresented at Encontro da Associação Nacional de Pós-Graduação e Pesquisa em Administração*, 36., Rio de Janeiro: ANPAD, 2012.

[3] Arora, A. and M. Ceccagnoli, "Patent protection, complementary assets, and firms' incentives for technology licensing," *Management Science*, vol. 52, n. 2, pp. 293-308, 2006.

[4] Bezerra, C. M.; *Inovações tecnológicas e a complexidade do sistema econômico*. São Paulo: Cultura Acadêmica, 2010.

[5] Bieberbach, A.; "IP strategies in business operations with China," *Journal of Business Chemistry*, vol. 9, n. 3, pp. 161-166, Oct. 2012.

[6] Brasil. Lei no 10.973, de 2 de dezembro de 2004. Diário Oficial da República Federativa do Brasil. Brasília, DF, 03 dez. 2004, p.2. Retrieved 16/06/2013 World Wide Web, http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/lei/l10.973.htm.

[7] Caerteling, J. S., J. M. Halman, and A. G. Dorée, "Technology commercialization in road infrastructure: how government affects the variation and appropriability of technology," *Journal of Product Innovation Management,* vol. 25, n. 2, pp. 143-161, Mar. 2008.

[8] Carneiro, A. M.; *Proteção de ativos na indústria de software: estratégias e tendências de propriedade intelectual.* Tese (Doutorado), Universidade Estadual de Campinas. Instituto de Geociências, Campinas, SP, 2007.

[9] Chaudhry, P., V. Cordell, and A. Zimmerman, "Modelling anti-counterfeiting strategies in response to protecting intellectual property rights in a global environment," *Marketing Review,* vol. 5, n. 1, pp. 59-72, 2005.

[10] Chen, Y. and W. Wang, "Study on the intellectual property protection mechanism in the technical innovation of enterprise," *International Business Research*, vol. 3, n. 4; pp. 187-191, Oct 2010.

[11] Chesbrough, H. W.; M. M. Appleyard, "Open innovation and strategy," *California Management review*, vol. 50, n. 1, pp. 57-76, 2007.

[12] Closs, L. et al. "Intervenientes na transferência de tecnologia universidade-empresa: o caso PUCRS," *RAC - Revista de Administração Contemporânea*, vol. 16, n. 1, pp. 59-78, 2012.

[13] Conley, J., Bican, P. and Ernst, H. "Value articulation: a framework for the strategic management of intellectual property," *California Management Review*, vol. 55, n. 4, pp. 102-120, 2013.

[14] Cruz, L. A. C.; *O regime global da propriedade intelectual e a questão do desenvolvimento: o poder dos países em desenvolvimento no campo multilateral.* Dissertação (Mestrado) – Universidade Estadual de Campinas, Instituto de Filosofia e Ciências Humanas, Campinas, 2008.

[15] Dechenaux, E. et al. "Appropriability and commercialization: evidence from MIT inventions," *Management Science,* vol. 54, n. 5, pp. 893-906, 2008.

[16] Brasil. Comando da Aeronáutica. Departamento de Ciência e Tecnologia Aeroespacial (DCTA). Retrieved 08/01/2016 World Wide Web, http://www.cta.br.

[17] Di Minin, A. and D. Faems, "Building appropriation advantage: an introduction to the special issue on intellectual property management," *California Management Review*, vol. 55, n. 4, pp. 7-14, 2013.

[18] Dias, A. A. and G. S. Porto, "Technology transfer management at Inova Unicamp," *RAC - Revista de Administração Contemporânea*, vol. 17, n. 3, pp. 263-284, May 2013.

[19] Feldman, M. et al. "Equity and the technology transfer strategies of american research universities," *Management Science*, vol. 48, n. 1, pp. 105-121, 2002.

[20] Fitzpatrick, W. M. and S. A. Dilullo, "Strategic alliances and the management of intellectual properties: the art of the contract," *SAM Advanced Management Journal*, vol. 70, n. 3, pp. 38-45, 2005.

[21] Follador, A. N.; *Avaliação do processo de transferência de tecnologias de um núcleo de inovação tecnológica utilizando dinâmica de sistemas*. Instituto Tecnológico de Aeronáutica, São José dos Campos, 2015.

[22] Germeraad, P.; "Integration of intellectual property strategy with innovation strategy," *Research Technology Management*, vol. 53, n. 3, pp. 10-18, 2010.

[23] Gonzalez-Gelvez, D. M. and A. Jaime, "University patenting in Colombia," *Journal of Technology Management & Innovation*, vol. 8, n. 1, pp. 50-50, Feb. 2013.

[24] Brasil. Instituto Nacional da Propriedade Industrial (INPI). Sitio eletrônico. Retrieved 05/11/2014 World Wide Web, http://www.inpi.gov.br.

[25] Jain, K. and V. Sharma, "Intellectual property management system: an organizational perspective," *Journal of Intellectual Property Rights*, vol. 11, pp 330-333, Sept. 2006.

[26] Jannuzi, A. H. L., T. Oliveira and R. A. Cardoso, "Gestão da propriedade intelectual nas instituições científicas e tecnológicas: o caso da proteção patentária no Instituto Nacional de Tecnologia – INT," in *paper apresented at CONGRESSO da Associação Brasileira das Instituições de Pesquisa Tecnológica*, Rio de Janeiro: *ABIPTI* 2008.

[27] Jungmann, D. M. and E. A. Bonetti, *A caminho da inovação: proteção e negócios com bens de propriedade intelectual: guia para o empresário*. Brasília, DF: IEL, 2010.

[28] Kelm, M. S., D. K. Baggio, M. L. Kelm, M. P. D. Griebeler and J. O. Sausen, "A inovação como estratégia competitiva das organizações: um ensaio teórico," *RAIMED - Revista de Administração IMED*, vol. 4, n. 3, pp. 274-285, ago./dez. 2014.

[29] Leal, O. F.; R. H. V. Souza and F. Solagna, "Global ruling. Intellectual property and development in the United Nations

Knowledge Economy," *Vibrant, Virtual Braz. Anthr.*, vol. 11, n. 2, pp. 113-145, Dec. 2014.

[30] Longo, V. P. and W. S. Moreira, "O acesso a tecnologias sensíveis, " *Revista do Observatório das Nacionalidades*, vol. .8, n. 15, pp. 73-98, jul./dez 2012.

[31] Mello, M. T. L.; "Propriedade intelectual e concorrência," *Revista Brasileira de Inovação*, vol. 8 n. 2, pp. 371-402, jul-dez. 2009.

[32] O'Hearn, T.; "Guarding profits from innovation: successful intellectual property strategies," *DePaul Business &Commercial Law Journal*, vol. 6, n. 3, pp. 433-450, 2008.

[33] Oliveira, R. M.; *Proteção e comercialização da pesquisa acadêmica no Brasil: motivações e percepções dos inventores*. Tese (Doutorado) – Universidade Estadual de Campinas, Campinas, 2011.

[34] Pinheiro, B. J.; *Gestão da propriedade intelectual no âmbito da Inovação aberta: um estudo em empresas farmacêuticas nacionais*. Dissertação (Mestrado) – Universidade de São Paulo, Faculdade de Ciências Farmacêuticas de Ribeirão Preto, Ribeirão Preto, 2012.

[35] Ritter Junior, R. J.; *Os direitos da propriedade intelectual no sistema de inovação: interações entre universidade, empresa e governo*. Porto Alegre: Pontifícia Universidade Católica do Rio Grande do Sul, 2015. Retrieved 06/01/2016 World Wide Web, http://hdl.handle.net/10923/7260.

[36] Santos, M. E. R. et. al. *Tranferência de tecnologia: estratégias para a estruturação e gestão de núcleos de inovação tecnológicas*. Campinas: Komedi, 2009.

[37] Santos, R. L.; *Proposta de modelo para implementação de uma Intellectual Property Audit: aplicação em uma instituição de pesquisa, desenvolvimento e ensino*. Dissertação (Mestrado) – Instituto Tecnológico de Aeronáutica, São José dos Campos, 2011.

[38] Shahraki, A.; "Intellectual property valuation: case study in Iran," *International Journal of Academic Research in Business and Social Sciences*, vol. 2, n. 5, pp. 174-190, May 2012.

[39] Silva, M. V. V. and Silva, J. E. "Um estudo comparativo entre a legislação francesa e brasileira referente à proteção da propriedade intelectual, inovação e seu reflexo no desenvolvimento destas nações, " *Revista Jurídica ESPM-SP*, vol.4, pp. 207-230, 2013.

[40] Spivey, W. A., J. M. Munson and B. Wurth, "Implications of the America Invents Act for R&D Managers," *Research Technology Management*, vol. 57, n. 5, pp. 43-51, Sept. 2014.

[41] Teece, D. J.; "Business models, business strategy and innovation," *Long Range Planning*, vol.43 n. 2, 2010. pp. 172-194, 2010.

[42] Teece, D. J., G. Pisano and A. Shuen, *Nature and dynamics of organizational capabilities*. Oxford: University Press, 2000.

[43] Vives I Gràcia, J.; "Aspectos de propiedad intelectual em la creación y gestión de repositórios institucionales," *El Profesional de laInformación*, vol. 14, n. 4, pp. 267-278, July 2005.

[44] World Intellectual Property Organization (WIPO). *World intelectual property indicators*, 2010. Retrieved 24/08/2014 World Wide Web, http://www.wipo.int/export/sites/www/freepublications/en/intproperty/941/wipo_pub_941_2010.pdf.

[45] World Intellectual Property Organization (WIPO). *What is Intellectual Property?* Retrieved 18/06/2015 World Wide Web, http://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf.