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Differences in the patent management in Brazilian companies with and without plants abroad

Hilda Maria Salomé Pereira

Universidade de São Paulo – São Paulo/SP, Brasil

Eduardo Pinheiro Gondim de Vasconcellos

Universidade de São Paulo – São Paulo/SP, Brasil

RESUMO

Diferenças na gestão de patentes em empresas brasileiras com e sem plantas no exterior

Neste artigo, são comparados os procedimentos de gestão de patentes em empresas brasileiras locais (que só possuem plantas no Brasil) com aqueles de empresas brasileiras internacionais (que possuem plantas em pelo menos dois países). Embora haja muitas mais variáveis a considerar quando se examina a questão das patentes nas empresas, aqui são apresentados e analisados os resultados de uma pesquisa qualitativa quanto à decisão de patentear as inovações, à escolha dos países onde patentear e ao significado estratégico das patentes para a empresa.

Palavras-chave: patentes, estratégia, internacionalização de empresas, gerenciamento de patentes.

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Hilda Maria Salomé Pereira, PhD e Mestre em Administração de Empresas pela Universidade de São Paulo e Pós-Graduada em Matemática Aplicada pela Faculdade de Moema (São Paulo) e em Administração pela Fundação Getúlio Vargas de São Paulo, é Professora na Pós-Graduação na UNITAU e Pós-Doutora na Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo (05008-010 – São Paulo/SP, Brasil). E-mail: hsalome@yahoo.com

Eduardo Pinheiro Gondim de Vasconcellos, Master Of Management pela Vanderbilt University e Doutor em Administração pela Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo, é Professor Titular da Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo (CEP 05508-010 – São Paulo/SP, Brasil). E-mail: epgdvasc@gmail.com

Endereço:
Universidade de São Paulo
FEA – Departamento de Administração
Avenida Professor Luciano Gualberto, 908
Cidade Universitária – Butantã
05508-010 – São Paulo – SP

1. INTRODUCTION AND OBJECTIVES

Given the importance of the technical knowledge to the company's competitiveness, the protection of property rights is essential for them to profit with the results of their technological efforts within fiercely competitive markets. Among the different forms and tools used to protect property rights, patents occupy a prominent position. In Brazil, as a rule, Brazilian companies have relatively little concern with the knowledge protection, including the knowledge developed internally and those acquired from third parties. It is assumed that this attitude may not be sustained in the global market. Therefore, it is necessary to investigate how the Brazilian companies, that have achieved success in the internationalization process, organize the protection of their proprietary knowledge, particularly through patents. Results will be useful to improve the patent management practices of companies that adopt an internationalization strategy.

From the perspective of intellectual property protection, questions that this paper intends to answer refer to the way the internationalized Brazilian companies deal with their patents. Doz and Prahalad (1984) indicated that, from the organizational standpoint, the biggest challenge for multinational companies' managers is to ensure the consistency of the strategic integration of their operations in different countries with the needs to meet local demands. On the other hand, Caves (1996) states that as soon as the company's first investment abroad is made, it should identify ways to integrate the activities of this undertaking to its general decision-making structure.

Cantwell (1995) pointed out the obligation of multinational companies to develop Research and Development (R&D) and technological interaction with local firms, especially in case of a subsidiary located in an environment where technology is advanced. It is impossible to think of investments in technology without addressing the problem of ownership, given the economic values involved. Thus, it becomes mandatory to analyze how the administration and the international coordination of such ownership are made.

In the highly competitive international environment, patent management assumes important aspects, but it has been relegated to a secondary position by companies that operate exclusively in the national environment. The internationalization requires the establishment of corporate strategies regarding to patents, both in subsidiaries and headquarters.

Given these considerations, this paper aims to examine the differences between Brazilian companies with and without plants abroad, with respect to:

- the company's decision regarding the patenting of innovations;
- the selection of countries where to apply and request patent protection;
- the advantages of patenting – the strategic importance of patents.

In this study, **Brazilian companies** refers to those companies that operate and own plants in Brazil, whatever their capital origin.

1.1. Background

Since 1992, with the regulation of investment of Brazilian companies abroad by the Brazilian Central Bank, this type of activity has grown in Brazilian organizations. Initially, some companies made tentative associations with companies abroad by creating holdings, representative offices, technical assistance workshops, or even branches and subsidiaries outside the country. Although the main motivation for many of them was to facilitate the capital international transaction, some of them invested in productive activities abroad, seeking to conquer markets in Latin America, the United States, Europe, Africa and Asia. These activities have been increasing, as shown by the Brazilian Central Bank's Census of Brazilian Capital Abroad (Table 1).

This trend suggests the need for a better understanding of the internationalization process of Brazilian companies. According to Teece (2008) the definition of the coordination mechanisms of the company international activities is crucial in order to get the maximum result from differentiated activities, managed remotely. The property rights management is included among the activities that must be coordinated remotely, allowing the company the best use of their proprietary assets.

Rugman and D'Cruz (1993), in their study of Canadian multinationals, and Kumar and Elingson's (2007) study about China, illustrated the need for local studies about management problems, because even recognized models may be ill-adapted to the economies of developing countries. The review of their intellectual property management procedures is important for two main reasons: today, knowledge is the first item on the agenda of international negotiations, which makes it an important asset for the companies; and Brazilian companies have little tradition and experience in this area. Although important and complex, the subject has been largely overlooked in other studies in Brazil, in particular the administrative aspects involved.

1.2. Patent and national companies

Brazilian companies, as a rule, patent very little. Data obtained from World Intellectual Property Organization (WIPO) show

Table 1

Brazilian Capital Abroad – CBE^(*)

Breakdown	2007	2008	2009	2010
Total	197.258	211.999	223.250	274.621
Direct Brazilian investment	139.886	155.668	164.523	189.222
Equity stake	111.339	113.755	132.413	169.066
Intercompany loans	28.547	41.914	32.110	20.156

(*) *Capitais Brasileiros no Exterior*.

Source: Banco Central do Brasil (2010).

that in 2012, Brazilian companies and researchers submitted 6,600 international applications for patents via Patent Cooperation Treaty (PCT)⁽¹⁾. In the same period there were 2.3 million international patent applications globally. Even more significant: data published by the *Instituto Nacional da Propriedade Industrial* (INPI – National Institute of Industrial Property) shows that in 2012, the number of PCT applications by residents was a mere 71. The data related to PCT are particularly relevant because they indicate the intention to use patents internationally.

There are several factors that explain these results. Some of them are: lack of knowledge to design an adequate strategy for Intellectual Property (IP) protection; lack of financial and human resources to handle the high costs and cultural aspects involved. The protectionist industrial policy in force in Brazil for many decades contributed towards a reduction in the innovation culture of companies and the doubts about the effectiveness of the Brazilian laws also contributed to reinforce this culture (Xavier-Oliveira & Laplume, 2013).

Although Brazilian companies that internationalized their activities do not position themselves as leaders in technological innovation, Stal (2010) shows that they follow the state of the art, aggregating the knowledge available to their respective sectors at the global level. According to Freeman (1982), companies showing this profile, followers of innovation leaders, use patents for the protection of their rights as innovators, but above all, through patents, they seek to get a defensive position against third parties that may question their right to use the proprietary technology.

Globalized national companies show a more accurate perception about proprietary questions. Petrobras, for example, which has been operating abroad for years, is the Brazilian company with the highest number of patent applications.

For domestic companies starting their activities abroad, given their relative lack of experience in the management of IP, it is useful to know how Brazilian organizations address this issue.

2. LITERATURE REVIEW

2.1. Property rights

According to North (1973; 1991; 1994), economic performance is a function of the institutions and their evolution. Institutions are the formal and informal constraints imposed by human beings to model the interaction between people. Its main role is to reduce uncertainties by providing a framework for everyday life.

Since every economic transaction involves the transfer of an asset's ownership rights (Ricketts, 2002), there is a ubiquity in the property institution. For Milgrom and Roberts (1992), the property institution, along with reliable property rights, is the most common and effective incentive for the creation, maintenance and improvement of assets.

The property analysis, in economics, focuses on two subjects: the possession of residual decision rights and the allocation of residual resources. "Owning an asset" means to have the right of residual control over this asset – the right to make any decision not controlled by law or allocated to another person by contract, regarding the use of this asset (mainly a decision made by the manager, who becomes the residual controller).

The owner of an asset eligible to receive all residual incomes, that is, the remaining income after the payment of all financial obligations: it then becomes the residual claimant. When residual return and residual control are combined, they become the key to the powerful incentive effects of the property, because the decision maker receives all the financial effects of his/her choice, and so the residual decisions tend to be efficient.

If the property is uncertain and may be restricted or lost, there is a discouragement from the owner to invest for its improvement or maintenance. If the property rights are not tradable, it is unlikely that the assets are in possession of those who will make the best use of them. If they are not reliable, the owners will not make large investments in assets which may not reap rewards. If they are not secure, there will be incentive to theft and lower investment in assets, which can not be easily preserved (Milgrom & Roberts, 1992). One of the most relevant ownership problems refers to the knowledge and skills of human resources, important assets in advanced economies. Transactions that involve development and transfer of technology deal with a *sui generis* "good" (information), difficult to define and appropriate, subject to confidential procedures, with final results difficult to determine. It is not easy to quantify the value of a given technology because its economic results are uncertain, the detailed engineering and testing can be very expensive, and the amount that the end buyer will be willing to pay is unknown. Because information is highly asymmetric, the parties are subject to adverse selection and moral hazard. Given that the appropriation of knowledge is essential and (in that it is an intangible asset) complex, it is important to understand how organizations manage and coordinate intellectual property protection.

North (1991) shows that rights and their enforcement depend on the institutions, which vary in different societies. Among the challenges faced by managers of multinational companies to preserve property rights on the knowledge developed or acquired is to coordinate the company international activities related to this protection, using local rules and preserving the company's global strategy in the most economical way.

2.2. Intellectual property protection instruments

Intellectual property protection mechanisms include patents, trademarks, secrecy, protection to know-how, contracts, being ahead of the competition (which can guarantee privileged access to the market), possess specific assets that are difficult to reproduce. It is considered that the most effective way to ensure the knowledge appropriation is to use a combination

of those means (Teece, 1986; 2008; 2010; Milgrom & Roberts, 1992; Mansfield, 1994; Bonnacorsi & Piccaluga, 1994). Salomé-Pereira (1998) and Gallié and Legros (2012) pointed out that in attempting to protect their innovations, companies can choose from a range of mechanisms, which may be either non-statutory (trade secrets, design complexity, and lead-time advantage over competitors) or statutory (patent, design registration, trademark, copyright).

Little is known about how companies actually make their choices among these different probable mechanisms but it is clear that the choice of a given protective method emerges out of a complex strategy. Tigre and Marques (2009) demonstrate that many Information Technology (IT) companies do not use legal means to protect their intellectual property, choosing instead to make use of technologies such as Digital Encryption Authentication (cryptography), Access Control and Systems Auditing and Segregation of Duties.

In this regard, the Trade Related Aspects of Intellectual Property Rights (TRIP) Agreement, when regulating issues of Intellectual Property for the World Trade Organization (WTO), expanded the definition of protection instruments to intellectual capital, in order to include Brands, Patents, Industrial Design, Know-How, Contracts and Confidential Information. The Agreement made predictions about hybrid rights, such as copyright protection aimed more at preserving the investment than at the aesthetic or scientific creation or protection of innovations. One example of this is the protection of cinematographic or theatrical adaptations, and not just the literary work from which they were adapted (Barrozo & Teshima, 2013). However, despite the well-known deficiencies of patents, such as their inadequacy to protect some fields of knowledge, time limits, enforcement difficulties, costs – the patent institution is still considered the most efficient mechanism to protect IP.

Procedures for obtaining an efficient patent protection are complex. Marcovitch (1994), Vasconcellos, Bruno, Campanário and Noffs (2009) and Bromfield and Barnard (2010) stated that it is necessary to link the company's patents policies with the company's strategy and R&D strategy, as patenting may be favorable on many occasions but it can be inconvenient at other times. For example, sometimes a company does not wish to expose its new research lines to competitors which will become apparent through analysis of the company's patent portfolio. The disclosure⁽²⁾ of a technology through the document of patent might be inappropriate in terms of the company strategy. In this case the company may decide not to patent and assume the risk that another company may patent that technology. Risk management is a valuable tool for patent management.

Some information do not require patent protection for reasons of either economy or the patent inefficiency, because the company does not intend to explore the knowledge, or it is not relevant for the company, or it is out of the company's product line, or it is considered too difficult to enforce the property rights. However, some knowledge does require

patent protection. Between the two extremes, there is a gray area, where the question of the convenience in patenting must be answered. The organization is responsible for setting up a decision making system for issuing intellectual property. Sometimes a patent can be an instrument to block a competitor technological innovation.

The operation of a patent management system involves several activities: to draft, monitor the applications, define the country where the application originated, define the countries where patent protection will be requested, monitor applications in countries with differentiated legislation/enforcement, follow the procedures of the competition, monitor and fight against potential piracy. There are also procedures for the acquisition and provision of patented technology: what to buy, where to buy, what to sell, what to exchange, and what to license. Other aspect to be considered is the evaluation and reward system for employees who generate patented knowledge. Although little attention is given in Brazil to reward researchers who generate patents, this is not the case of global companies from developed countries. How, therefore, could companies reconcile different practices in different subsidiaries? What procedures could be adopted to deal with the fundamental knowledge that is so essential for the future development of knowledge? How can companies be defended against allegations of illegal use of knowledge that has been patented by the competition?

Figure 1 shows how Japanese companies evaluate the use of their patents, and the importance of the so-called “defensive” patents.

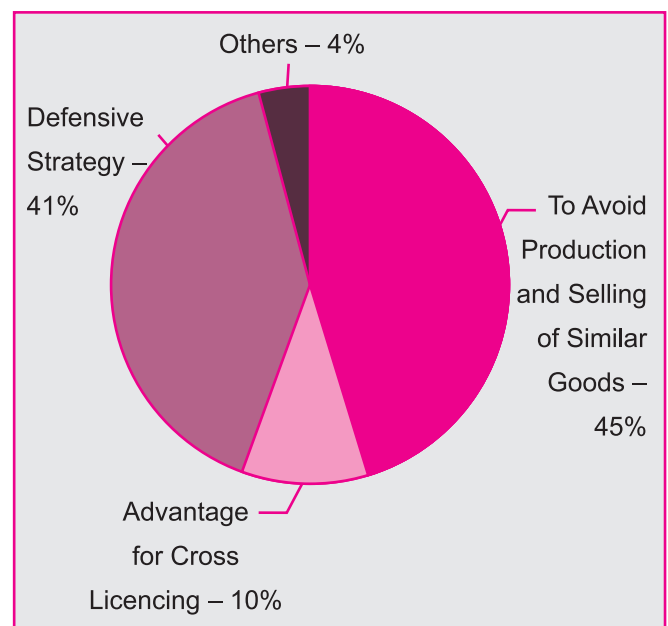


Figure 1: Why Japanese Companies Patent

Source: Corporate Intellectual Property Trends, JPO (March 1998, *apud* Arai, 2000).

The patent system represents a valuable support to the negotiation of technology because it allows the identification of the state of the art and the position of companies engaged in technology to be negotiated.

The administration of intellectual property in organizations is far from trivial. There are plenty of models to perform this function, ranging from completely internalizing procedures to completely outsourcing them. The norm is a combination of internal procedures and external hiring. Arai (2000) shows models used by different Japanese companies, which range from adopting the complete internalization of the patent administration up to the hiring of international patent offices.

2.3. Companies strategies in relation to patents

Hanel (2006) and Caviggioli and Ughetto (2013), among many authors, deal with intellectual property management in companies, but Arai (2000) in a document published by WIPO presents a solid study comparing the approach to the patent issue between Japanese companies and those from other countries. He concluded that the corporate strategy for patents in the 21st century should cover four bases: management, technology, international and legal.

2.3.1. Management

Patents are important management tools in corporations, where “strong” patents are a powerful weapon for the company’s competitiveness. It is difficult for a company to survive when competitors have this weapon. Considering that patents are “goods” that can generate profits as much as other products, managers and shareholders started to organize the industrial property departments as profit centers rather than expense centers. Large Japanese companies that decided to dispose of their patents, reserving only the essential ones for their future development, have been earning significant profits from royalties. This requires that the company owns and uses valuable patents, whose real value lies in the fact that other companies are forced to license them.

2.3.2. Technology

There is a fierce competition among the producers of patentable technology to ensure the possession of strong patents. Patents are a crucial part of the technology strategy since they guarantee benefits for those who had the initial idea. The patent system is essential for generating new ideas and technologies, as proven by centuries of experience.

Patents encourage the company’s internal technological development as they motivate employees and encourage the R&D personnel – but it is essential that the company knows how to reward them. Merely being mentioned in the patent document is no longer considered sufficient reward for the researchers.

And, if for “regular” patents it can be considered that the salary already provides the necessary reward, for the “strong” patents, it no longer applies. As the world moves toward patentable intellectual property, and given the cost of setting up factories and hiring workers, an interesting strategy is to sell the brain product and for doing so, it is necessary to patent wisely. Small and Medium Enterprises (SMEs) need to be careful with the proposals of larger companies, which offer partnership and aid, but reward the knowledge of the fragile company poorly. Large companies may also threaten small holders of technology by claiming infringement of proprietary rights. Patents can be used as a protection instrument by the SMEs.

Documents of Patent allow learning technologies on-line. The analysis of these documents allows one to identify the state of the art, compare technologies and decide whether it is worth investing in the development of a certain technology rather than acquiring it from its owner.

Finally, through examination of the applications, patents provide means to identify the competitors’ strategy, their areas of interest, their development and the areas and markets where they are preparing to compete on.

2.3.3. International

In the global market, the importance of patents in the international strategy of companies has been increasing. Under the WTO, in the TRIP Agreement, the patent system has become global. It is possible that strong trust relationships minimize the risks in domestic markets, but the international battlefield is different, because patents are often the only protection available. The more a company is active internationally, the more it will find similar rivals, with similar products and patents, and it will find frictions in the patents, as well as counterfeits (Teece, 1986; 2010; Arai, 2000).

2.3.4. Legal

The corporate IP departments initially focused on finding available patents, assessing the importance of these patents and negotiating their licenses, managing and supervising the patents on imports of technology. Later they also became licensors of technology and started applying for patents abroad, licensing technology, handling contracts and other legal aspects involved as well as monitoring markets and handling the infractions.

Patent disputes can lead to serious crises. In the example of Japan, counterfeit products, violating the patents of a company, caused a sharp drop in the company’s sales, which was subsequently forced into bankruptcy. On the other hand, there are companies that violated patents of competitors, were brought to court and sentenced to pay such high amounts that their survival was impaired. In the global economy, every company should have a legal strategy for patents.

Sterling and Murray (2007) evaluating the strategy in the management of intellectual property of DuPont, concluded that, at the strategic level, the companies need to have a corporate commitment to capture and increase the value of their intellectual assets, in a more proactive approach. Companies need to facilitate the growth of the returns on licensing and encourage their business units to be wide-awake and provide resources for the portfolio of intellectual property.

2.4. Models for the intellectual property commercialization

Commercialization of IP can be accomplished by selling or licensing the patent. Licensing is a permission to use the technology but the property remains with the company that owns the patent. Davis and Crawford (2006) analyzed the success of some leading companies in the licensing of their IPs. They mentioned the example of IBM, which reported an annual income of US\$ 1.5 billion, from the licensing of patents on an asset of 25,000 U.S. patents.

The idea of commercializing IP is not new, but the commercial business of IP has been just starting. While companies such as IBM, Procter & Gamble and Dow Chemical use robust marketing strategies to sell or license their patents, others, such as GE, Kodak and 3M, explore the concept of patent as a business function; all of them have a corporate commitment to the annual IP results. Analysis of the efforts of these pioneers provides valuable insight into the best practices and the formulation of a reliable framework to create value on a recurring basis. Davis and Crawford (2006) propose the utilization of commercialization models of IP to help intellectual property administrators to evaluate, find opportunities and risks, and, abandoning the trial and error approach, manage potential transactions lines. Transforming the IP commercialization into a business process requires that the company's senior leaders stimulate and support the process with long-term commitments and objectives reflecting the organization's strategic goals.

Davis and Crawford (2006) suggest ten critical aspects in order to identify an organization's readiness for the IP commercialization and the development of reasonable expectations. The items considered critical within the definition of the model are: definition, leadership, use of IP, availability for the licensing of core technologies, the decision to rethink the department dedicated to the IP management, accessibility of the PI for review, negotiation and commercialization, and a flexible posture regarding the development and/or acquisition of innovations.

3. METHODOLOGY

The core question of this research is the relationship between the existence of plants located abroad and the management of patents, in Brazilian companies. Given that the subject is unknown in the national environment, the study was planned in two steps: interviews based on a pre-tested script to confirm

the important variables in the Brazilian environment; and quantitative research. Based on the recommendations of Selltitz, Jahoda, Deutsch and Cook (1974) for exploratory research, the available literature on the subject was preliminarily examined.

It was then identified Brazilian companies with a certain degree of internationalization (exports, overseas offices, plant abroad) to conduct the interviews. Relevant criteria for the selection were: different sizes in terms of revenue; different sectors; and personal contacts to ensure the time required for in-depth interview. The following companies accepted to take part of this first step: Basf, Embraer, Votorantim Celulose e Papel, Sintefina, Wahler, Vallée. Therefore, we worked with a purposive sample, with no intention of raising quantitative data, but rather to gain information, knowledge and perceptions of people who acted and act protecting the proprietary knowledge of the companies of the sample.

For purposes of this study, we treated as international companies those with plants in more than one country and national (local) companies, those with factories only in Brazil.

Semi-directed interviews were conducted with directors/managers, president, manager of IP and heads of the research who are/were deeply involved with the R&D process in each one of the companies selected. These interviews highlighted the most relevant issues to the administration of patents in the national system. In some companies we interviewed a single person, in others, two people. The interviews lasted on average one hour and a half and were recorded and transcribed.

Based on the literature and preliminary interviews conducted, the variables to be examined were determined (Figure 2), and then, we developed a Web-based survey instrument, which was sent to around 240 innovative companies in several sectors of the economy. Out of the 62 responses obtained, 48 questionnaires were validated, considering only one response per company, and we chose the questionnaire answered by the professional with greater access to intellectual property issues. The results were tabulated and submitted to statistical analysis.

This paper shows the results of the research concerning: how companies patent their innovations; which countries are chosen to validate the patents; the importance of patenting in the company's perspective.

Tentatively, for the purpose of analysis, companies were grouped by origin of capital (higher and lower than 50% of foreign capital), by level of technological innovation (highly/little innovative), and sales greater than or lesser than US\$ 86.3 mi (500 largest companies) and by internationalization (having or not plants in more than one country).

These results were crossed with the responses related to the practice, declared by the company, of patenting, or not, their innovations. It was applied then the chi-square test to determine the relationship between the variables, that is, associations or dependence. It refers to one of the most commonly used statistical tests, which does not make many assumptions about the underlying population and is thus classified as non-parametric

Variables	Indicators	Authors
Existence of (plants) abroad		Teece (1986; 2008; 2010) Caves (1996) Arai (2000) Kumar (2001)
Patent policy	<ul style="list-style-type: none"> • Company patents innovations • Country/region of the patent application • Criteria for choosing the countries 	INPI WIPO Interviews
Strategic importance of patents in the company's perspective	<ul style="list-style-type: none"> • Contributes to the image of the company • Delays the time to copy • Defense against allegations of piracy by competitors • Encourages the researcher • Expected benefits exceed application and monitoring costs • Facilitates technology trading • Imports to suppress copies in technology of easy reproduction • Useless when the reproduction is difficult • Allows trading licenses with other companies • Complements other means of protection • Facilitates new alliances 	Freeman (1982) Marcovitch (1992) Vasconcellos (1992) Teece (1986; 2008; 2010) Salomé-Pereira (1992; 1998) Bonaccorsi & Piccaluga (1994) Arai (2000) Davis & Crawford (2006) Interviews
Costs and difficulties to patent	<ul style="list-style-type: none"> • Costs (to write, register, monitor, defend) • Deciding the appropriate strategy for the protection of the product • Deciding when to file a patent application • Lack of sensitivity of researchers • Lack of adequate staff • Operating in inadequate legal system • Excess time to achieve the patent • Lack of protection for products / sectors 	Freeman (1982) Teece (1986; 2008; 2010) Salomé-Pereira (1992; 1998) Bonaccorsi & Piccaluga (1994) Arai (2000) Davis & Crawford (2006) Salles-Filho, Carvalho, Ferreira, Pedro & Fuck (2006) Rosas, Froehner & Sbragia (2007)
Other instruments used for the IP protection	<ul style="list-style-type: none"> • Confidentiality clauses in contracts • Secrecy • Copyrights • Trademarks • Time ahead • Associations, joint ventures 	Teece (1986; 2008; 2010) Bonaccorsi & Piccaluga (1994) Arai (2000) Brown, Osborn, Chan & Venkat (2005) Mouritsen & Koleva (2005) Davis & Crawford (2006) Hanel (2006)

Figure 2: Research Variables

(Wonnacott, T. & Wonnacott, R., 1977). As a test that measures the relationship between frequencies and not between proportions, based on the difference between observed and calculated frequencies, the chi-square is indicated for relations between non-numeric scales, that is, nominal, and can be used for dichotomies (Blalock, 1972).

It is essentially an adhesion test, where the observed frequencies are compared with frequencies expected if the hypothesis of no association or independence (null hypothesis) is true: if the calculated measure is considered weak, the null

hypothesis is rejected. The bigger the differences, the higher the value of the chi calculated, equating to zero in the case of equal observed and calculated frequencies. In this case, the Excel program was used to calculate the chi-square test.

The sample size soon proved to be a limitation of the research. As the number of respondents was small, and the number of validated questionnaires was even smaller, some analyses using the chi method were affected. It has been decided, in this case, to present only the quantitative data in relating to some variables.

By dividing the sample into companies with or without plants abroad, we studied the research variables, that is, why patent, where, what are the barriers faced and what are the other IP protection instruments used in order to answer the questions proposed.

In this paper, we analyze the results of the companies grouped by the variable internationalization (with / without plants abroad).

As the interviews proved to be a rich source of information, we decided to join to the statistical results many of the comments obtained, thus providing an in-depth cut in the examination of some research questions. Thus, we added to the qualitative study (case studies) opinions of persons involved in IP in the company in order to identify the relationship between having or not plants abroad and the practice of patenting innovations.

4. ANALYSIS OF RESULTS

In this paper, we present the analysis of the results obtained in the study according to: the company's decision regarding the patenting of innovations; the selection of countries where to apply and request patent protection; the strategic importance of patents.

4.1. The company's decision regarding the patenting of innovations

The strongest result of the statistical analysis and, at the same time, the most important in the scope of this study, was the confirmation that there is a statistically significant relationship between the activities of patenting innovations and the existence of production unit(s) of the company in foreign markets. Table 2 shows the result of the calculated chi, which allows us to affirm that the null hypothesis (that is, that there is no difference as to the practice of patenting the results among Brazilian companies that only operate in Brazil and Brazilian companies that have plants abroad) can be rejected with approximately 3% of confidence that the results did not occur by chance.

As it can be seen, out of the companies that have plants in more than one country, only 4% do not patent their innovations, while 96% do so, that is, almost all of them use patents. This is a strong indication that companies operating abroad necessarily have to deal with the patents administration. This is in line with the statement exposed by (Arai, 2000).

Other crossings showed a weaker relationship. For example, the chi square for innovative companies (with original products and processes) and non-innovative in relation to the patenting

Table 2

The Use of Patents By Companies

Operation	Does your company use to patent the results?					
	Yes		No		Total	
The company owns plants in more than one country [Including Brazil]	24	63%	1	13%	25	54%
	96%		4%		100%	
Brazil	14	37%	7	88%	21	46%
	67%		33%		100%	
Total	38	100%	8	100%	46	100%
	83%		17%		100%	

Note: (*) Considering the response that indicated the highest level.

Observed	Expected	(f.obs - f.e)² / f.e
24	20.652	0.5427002
14	17.348	0.6460717
1	4.348	2.5778261
7	3.652	3.0688406
? =		6.8354386
By the Qui Test Formula of Excel =		0.0773320

of their innovation was 0.43818834, a result still important, but that shows a much less strong relationship between patenting and innovation.

However, the relationship between patenting or not, and the origin of the company's capital, or between patenting or not, and the company's revenue, for example, were not significant in the statistical analysis.

The strong correlation between owning plants abroad and patenting indicates the relevance of examining the results obtained in the variables adopted for the research for companies that own plants abroad, and eventually, compare them with companies with plants in Brazil only.

Votorantim Celulose e Papel (VCP) is one of the most innovative of the Votorantim group, by definition dedicated to more traditional products. However, VCP, which has no plants abroad, does not usually patent its innovations – until the interview, it had only two patents. According to the respondent:

We still don't treat our technology as a sales item, we often negotiate the transfer, where the client receives the staff of VCP, the technology (which is quite implicit) and pays a percentage on the improvements (which may be on the reduction of production costs). Our policy is not to make a proprietary model and sell, but to seek potential stakeholders, show what is done at VCP, which only VCP knows how to do and propose the acquisition, without patenting anything. But it is clear that the world is migrating from tangible to intangible assets, and it will happen at Votorantim, but we must go slowly.

Wahler, a German company in the automotive industry, headquartered in Stuttgart, which has a subsidiary in the United States, stated that the plant in Brazil contributed to several changes in the procedures involving patents in the parent company, and also that its United States subsidiary has contributed to the changes in dealing with patents:

Many changes related to the IP appeared after we started working in the United States where the patent is taken much more seriously. In the American market, we must be more careful about patents. We have a case in which the competitor (United States) copied our product without checking if it was patented. We filed a claim in court, and the competitor will have to pay. And it happened because we detected a difficulty of the competitor, found a solution and before entering the market, we patented it. The success of the patent was due to our perception that the competitor would copy and therefore, in the claim⁽³⁾ we anticipated all the alternatives of copying. The competitor continued to copy for two years, although we had warned about

the existence of our patent. This change in the view of the patent document was very important, to the extent that when we contacted the American lawyer, he said that everything was very easy, we just had to file a claim. We saw the competitor's product, which won the Ford's account that we virtually lost. Well, Ford has asked us not to adversely affect the production of trucks, and Wahler agreed, provided that it would not affect the company. Thus, Ford is also monitoring the procedure, and forcing the competitor to negotiate, under the penalty of being excluded from the contracts with Ford.

Embraer, an innovative company that has been abroad for many years, rearranged and systematized its internal protection system and its patent office after opening its first plant abroad. Another significant data, which appears in the interviews, is that the systematization of the corporate patent management system eventually makes it clear, in the company, that checking patent documents is a necessity, not only to support the decision to apply for a patent or not, but for the development of the company's technology strategy. The presence of an efficient gate keeper means monitoring the state of the art of innovations, the strategy of competitors, the location and identification of negotiable technologies and, finally, an indication for potential partnerships, in short, the development of a true mapping of the innovation in the company's segment of operation.

In the interviews, the decision on patenting the research results was considered one of the greatest difficulties. What to patent, what not to patent, the right time to file a patent application, the decision on the claims to be submitted. All of these decisions depend on the company's technology and overall strategy, and also on the presumed strategy of competitors and, in the case of multinational companies, on the protection offered in each country where patent could occur. All these factors must be individually examined. Besides all these factors, it is necessary to consider the researchers' opinion, which may determine whether the innovation is ready to be patented or if it needs further development, in which case they may or may not be applied for a preliminary patent. The way researchers can be cited in the patent document can also affect the motivation for patenting by these players. And, as patents constitute an important asset of companies (Galbreath, 2005) the company's financial sector should also be heard. In addition: according to Cohen, Goto, Nagata, Nelson and Walsh (2002) the company's strategy for a country and/or a product, can affect the patent application and its claims. When the company aims to negotiate patents, for example, instead of a single application with multiple claims, it may request several patents for each one of the innovations introduced in a product.

In the interviews, Embraer, for example, reported to be developing a methodology for this analysis, while the Brazilians Basf and Wahler seem to have greater difficulty for this

decision as they also depend on the strategies settled by their companies' main office.

4.2. Selection of countries where to apply and request patent protection

Table 3 shows where patent applications are filed, according to the companies.

While 67% of the companies that have plants in Brazil only file the application from the INPI (the local patent office), 80% of companies with plants in other countries also file the application from the patent office of the United States. The fact is that companies that do not have plants in other countries, but that could protect their exported products, or at least, have patents, as an instrument of negotiation and marketing, do not seem to be aware of these possibilities.

The preference for certain countries, according to the interviews, is related to the seat of the research department or to the fact that by the time of the survey, had a strong impression that the patents examined in the first place in the United States and Europe must meet fewer requirements when the application is extended to other countries, via PCT, than when first examined by the Brazilian patent office. It was suggested that there is lower confidence, on the part of international offices, in the Brazilian patent examiners.

Another reason mentioned for filing the patent from the United States is that there the length of time demanded for the privilege granting is shorter. European venture capital firms prefer to file through its central research department,

in the host country of this department, or in the European Patent Office.

There are companies that adopt the procedure of filing the patent in the office of the country where the idea was developed first, for example, the Brazilian branch developed the research, it is requested to make the application for privilege in Brazil, and then extend it to other countries.

There is an important fact that is rarely (if ever) mentioned: companies value the rapid response of the United States patent office with respect to moving to the examination phase of the patent application, indicating that there is a possibility for the patent to be granted, since it helps to raise expectations about the granting of patents or not, and to formulate the company's strategy regarding the treatment of innovation subject matter of the patent application.

By the time of filing, countries where the patent will be applied are chosen, via PCT. Table 4 presents the responses of the companies, classified as having or not having plants in more than one country, for this question.

The strongest reason mentioned for the decision of where to patent is the company's market. Secondly, the regions of greatest economic influence are chosen. Possibilities of regional copies and the IP local organization appear as slight motivating reasons. Embraer confirms: they patent in the United States, France, Germany and England, use the PCT and selectively consider China, Japan and Russia for applying a patent. The company's market is what drives the decisions.

Although Griffith, Miller and O'Connell (2010) comment that countries that impose higher tax rates on the income aris-

Table 3

Where are Filed Requests of Privilege

Filing a Privilege The request for privilege is filed from the patent office of which country	Operation		
	Company owns plants in more than one country (including Brazil)	Plants just in Brazil	Total
Brazil	6 33%	12 67%	18 100%
USA	12 80%	3 20%	15 100%
Germany	3 100%	0 0%	3 100%
France	1 100%	0 0%	1 100%
Switzerland	1 100%	0 0%	1 100%

Note: Accepting multiple answers.

Table 4

Where Patents are More Applied

Regions where the patent usually takes place(*)	Operation		
	Company owns plants in more than one country (including Brazil)	Companies with plants just in Brazil	Total
Europe	21	9	30
	70%	30%	100%
North America	20	10	30
	67%	33%	100%
Asia	14	6	20
	70%	30%	100%
Others	10	6	16
	63%	38%	100%

Notes: (*) Accepting multiple answers. "Others" regions most frequently cited are Latin American countries (Argentina, Mexico, Chile), France and Japan.

ing from patents of overseas companies indicate a downward trend in patent applications, as companies would tend to host R&D and apply for patents in countries with lower tax rates, this argument for choosing the country where to patent was not mentioned in any interview, or in the questionnaire answers.

Choosing the countries where to patent can be very complex, as shown in the interview with Wahler, a German company in the automotive industry, headquartered in Stutgard, which owns a subsidiary in the United States, and whose main products are valves and compressors.

For Wahler:

If the technology is developed in Brazil, the patent application takes place in Brazil for one-year protection, to start, and the protection is also requested in Germany. If it is in Germany, the application takes place in Germany. This is not a healthy procedure because if the person making the decision in Germany fails to remember Brazil, the innovation remains unprotected here. This has happened many times, and it is bad because Brazil is an important market. Germany has a technological demand and they will always be ahead in terms of technology. And they have also forgotten the United States, where we have a huge potential market. For example, we have a valve that controls engine emissions, which will be mandatory in the USA as from 2010. But our patent only covers Germany and Brazil. There is a lack of policy for patent protection in different regions, which is crucial. We are fighting for it. But now we are coming with new products in the United States and they are all protected by

patents. We would also like to have a single patent office serving the company, preferably the one that serves us in Brazil.

We intend to file the patents in other markets too, with business development. We have applied in China, India and Japan. "In Europe, we file the application in the European community, or in France, Italy and Germany.

EMBRAER – the company's market is crucial when choosing where to patent, but there are other factors that influence this choice.

4.3. The strategic importance of patents

The data obtained for the variable "importance of patents, in the opinion of the companies" are presented in Table 5. The statements are arranged in descending order with respect to the total percentage of the responses frequency "agree", because it facilitates the visualization of the agreement degree of the companies with respect to the questions. However, it shall be reminded that question 8 is actually negative, and should be considered, on the contrary, by the "disagree" frequency. Note that, in this matter, the opinions of the persons involved with IP matter in companies, are predominantly taken into consideration.

The total results are significant and enable us to analyze what the companies, in general, consider as a positive point. Thus, the statement that patents are a complementary protection is almost unanimity in the answers (99%), but there is not a common agreement that patents can prevent lawsuits from competitors (question 3). They are considered important to negotiate licenses with other companies, to build the

Table 5

Importance of the Patent for the Company x Operation

Importance of the patent for the company		Operation					
		Company owns plants in more than one country (including Brazil)		Brazil		Total	
11 – The patent will complement other means of protection	Agree	32	89%	6	86%	38	88%
	Disagree	2	6%	1	14%	3	7%
	Do not know	2	6%	0	0%	2	5%
1 – The patent will improve the company's image	Agree	30	81%	6	86%	36	82%
	Disagree	7	19%	0	0%	7	16%
	Do not know	0	0%	1	13%	1	3%
4 – The patent will encourage researchers	Agree	28	80%	6	86%	34	81%
	Disagree	6	17%	0	0%	6	14%
	Do not know	1	3%	1	13%	2	5%
10 – The patent will be fundamental to protect the core technology of the company	Agree	29	81%	5	71%	34	79%
	Disagree	7	19%	2	29%	9	21%
	Do not know	0	0%	0	0%	0	0%
5 – There is potential to negotiate the technology, then the patent will facilitate the negotiations	Agree	29	81%	4	57%	33	77%
	Disagree	6	17%	3	43%	9	21%
	Do not know	1	3%	0	0%	1	3%
12 – The patent will facilitate new alliances	Agree	28	78%	4	57%	32	74%
	Disagree	5	14%	2	29%	7	16%
	Do not know	3	9%	1	17%	4	10%
9 – With the patent, we can negotiate with other companies patent cross licensing	Agree	26	72%	4	57%	30	70%
	Disagree	2	6%	2	29%	4	9%
	Do not know	8	19%	1	17%	9	19%
2 – The patent will delay the copy	Agree	27	75%	3	43%	30	70%
	Disagree	8	22%	4	57%	12	28%
	Do not know	1	3%	0	0%	1	3%
6 – The expected benefits of the patent outweigh the costs for requesting and monitoring it	Agree	29	72%	2	29%	29	60%
	Disagree	5	14%	1	14%	10	21%
	Do not know	5	14%	4	40%	9	19%
3 – The patent will prevent the competitor, claiming that it already has a patent, from trying to prevent us to manufacture	Agree	19	53%	5	71%	24	56%
	Disagree	13	36%	2	29%	15	35%
	Do not know	4	15%	0	0%	4	13%
8 – For being a technology of difficult reproduction, the patent is useless	Agree	5	14%	4	57%	9	21%
	Disagree	31	86%	3	43%	34	79%
	Do not know	0	0%	0	0%	0	0%
7 – For being a technology of easy reproduction (piracy, type of innovation, “surrounding inventions”), the patent is important	Agree	27	75%	2	29%	7	16%
	Disagree	9	25%	5	71%	36	84%
	Do not know	0	0%	0	0%	0	0%

company's image, but they do not have much credit in terms of preventing "surrounding inventions", in the case of innovations easy to copy.

However, the respondents from Basf and Wahler are not completely in agreement with the proposition that the patents improves the company's image, and consider that each case is individual. For Basf, which is in the chemical industry, the recent episode of drug companies that products drugs against Acquired Immunodeficiency Syndrome (AIDS – in Portuguese: *Síndrome da Imunodeficiência Adquirida* [SIDA]), and were involved in a war against patents, patenting linked them to the image of companies insensitive to social problems, which denied access to knowledge protected by property rights essential to the survival of infected populations. They did not keep a positive image, which goes against the opinion expressed in great number of scientific publications, such as Milgrom and Roberts (1992), Arai (2000), Teece (1986; 2010).

Sintefina, also in the chemical industry sector, called the attention to the growth of generic products, mainly based on the loss of patents validity, and agrees that the consumer cares about costs (but the doctor, who prescribes, not always does the same). The image of high costs is related to the image of valid patents, because there is an impression that the companies unduly charge for the monopoly provided by patents.

For Wahler, also in the highly competitive automotive industry:

[...] the patent may even adversely affect the company's image, because it can represent a burden for the client: the client will have to pay more for the patented product, and will be limited in terms of supplier choices. In our industry, the client searches for the absence of patents. On the other hand, if the law forces a certain technology, the client seeks those who have know-how in the sector and who have the patents that interest them. But as soon as clients master the technology, they leave.

There are patents of Wahler jointly elaborated with the clients that, in spite of that, are no longer interested if V. imposes a condition of offering the product to the competitor. They only accept patents if they are under pressure, or if it brings a considerable economy for their products. There are clients, today, that only accept products in co-design. FIAT, for example: if you have a new technology for them, they accept it if it is co-design. The automakers suffered a lot with patents. Today, they protect themselves, trying not to get involved with patented products. When it is inevitable, they try to achieve technologies that would break the patents. We work in these terms, we try to achieve an innovation that is out of patent, which many times renews and adds to the patented knowledge.

We had a case, our global patent referring to an air-conditioner device whose valve used to leak. The greatest global manufacturer of air-conditioner could not sell its device due to this leakage. They called us and we presented a very simple solution, with a perfect closing and we patented it worldwide. Even though, the company did not buy our valve, but made an adaptation on its valves. It was a more expensive and poorer adjustment, but they did not get involved with patents. We had great expectation with the valve; we even exported them during four years to Spain. But Valleo had all GM market and forced its exclusivity in terms of patents. We made an assignment agreement with Valleo granting exclusivity to GM and remaining with 50% of the market. This agreement was valid for four years, the price of the product was good and there were no discussions. But, quoting prices in the global market, GM preferred to remain with the old product and leave the patent issue. Well, the truth is that if an automaker adopts it, all the others will adopt it too. Right now we have a flex engine and our electric valve in the USA. When Ford heard that GM used the gadget, went after the device too.

With huge fuel consumption, the automotive production and a huge demand for technology, the patents are necessary. But, if the demand is not big, forget it, because the consumer only pays it if the economy is clear.

Patents, therefore, may not be very interesting for clients in terms of prices. They can lead to legal disputes, but they can also be a guaranty against claims of "pirate" product production. In the pharmaceutical industry it is recognized that patented medicines have better image for those who prescribe them than for those who take them. Advantages and disadvantages need to be balanced in each company, even for each product, as the result of this analysis will certainly reflect on the technological plan.

The partial data showed in Table 5 in relation to companies with plants abroad or the ones with plants only in Brazil are also worthy some considerations. Thus, the possibility of additional means of protection has received positive rating of 94% of internationalized companies, compared to only 86% of local ones. This data may indicate less use of patents by companies with plants only in Brazil, which use patents lesser than international companies and rely more on other means of protection, as indicated in Sintefina and Vallée interviews. In general, it is frequent information in interviews that very efficient means of protection are connected to the industrial structure for the sector, such as the fact that the production demands large investments or that there is a privileged access to raw material sources (Bonaccorsi & Piccaluga, 1994; Salomé-Pereira, 1998).

Another interesting point is that despite 100% of national companies (in contrast to 82% of international companies) assessed that patents encourage the researcher (question 4) the national companies rarely reward their researchers properly, ignoring the statement of Arai (2000), that mentioning the researcher in the patent document or rewarding them with small prizes is no longer sufficient. The international companies, on the other hand, more used to patent issues, are not entirely in agreement about that item, because they consider that patents are not enough to encourage the researcher. The same observation is made for question 1 (patents enhance the company's image), because extraordinarily, local companies, which often do not even activate their patents in their reports, agree 100% with the proposition, while the international companies are more critical about it (81% of agreement).

International companies agree more often than the local companies that patents facilitate negotiations and ventures (questions 5 and 9), and provide protection both to core innovations as to those innovations easier to copy (questions 8 and 10). There is a higher level of agreement among the international companies than the national ones, on the question that the expected benefits from patents outweigh their costs. This may be attributed to the punctual manner of how patents are treated in local companies, which occasionally apply for patents, while the international companies maintain a broader policy toward patents – in a rough comparison, it is worth to highlight that costs of mass production are lower even when dealing with patents.

5. CONCLUSIONS

The main conclusion of this study is the confirmation that there is a significant relationship between the activities of patenting innovations and the company's operation in production activity in foreign markets. Table 2 shows the result of crossing these data and the calculation of chi square. The incidence of 96% of companies with overseas plants that work with patents shows the importance of this activity, reinforcing the propositions of Teece (2008; 2010). It was found the existence of a strong relationship between the internationalization of the productive activities of the companies and the use of patents.

We summarized below the findings related to the research questions.

5.1. The company's decision regarding the patenting of innovations

The research showed a significant relationship between the activities of patenting innovations and the company's operation in productive activity in foreign markets, with 96% of internationalized companies, of national capital or not, patenting and giving greater importance to patents than companies that operate only in Brazil, which coincides with the conclusions of Teece (2008; 2010).

On the other hand, in the interviews, there was a tendency to greater systematization in the treatment of patents in internationalized companies, with the decision to patent conditioned to technology planning and the latter, to the strategic planning (Embraer and Votorantim), which is in line with Marcovitch (1992) and Vasconcellos (1992). These companies adopt procedures closer to the current patent management models (Arai, 2000; Davis & Crawford, 2006; Sterling & Murray, 2007) by advancing from the traditional role of patents as property protection on innovations and company's defense against third parties, to a strategic concept of patents as value creator, a product integrating the company's portfolio, facilitating the establishment of joint ventures and research in cooperation and in the negotiation between companies. They suggest that this trend will remain, and even companies with plants only in Brazil will have to adapt to procedures in accordance with the internationalized context.

5.2. Selection of countries where to apply and request patent protection

Respecting the limitations presented by the sample size, another important conclusion is that companies with plants only in Brazil patent from the local patent office (INPI), while international companies prefer to file the patent application in the United States. In their statements, it was indicated that this preference is due to two reasons: the relative speed with which the North American office signals the patentability of innovation and the lower incidence of demands from other patent offices where the validation of the patent is requested when the application is requested from the North American office.

5.3. The importance of patents in the technology and internationalization strategy

The degree of agreement between companies that operate only in Brazil and internationalized companies vary (Table 5). For example, internationalized companies rely more on the strength of the patents to facilitate business (alliances, licensing, cross licensing) to protect core technologies, technologies of difficult reproduction, to delay copies and fight piracy. In the experience of these companies, there is a strong agreement regarding the benefits of patents outweighing its costs.

National companies rely more on the fact that patents improve the company's image and encourage the researcher. In the statements, internationalized companies indicate that patents may also worsen the company's image, depending on the product or industry, requiring a casuistic examination. On the other hand, as incentives, researchers no longer consider themselves rewarded only by a citation in the patent documentation.

The highest rate of agreement of all companies refers to the importance of patents as a legal instrument for property protection of innovations, acting as an adjunct to other means

of protection, such as confidentiality, secrecy, access to inputs and market dominance, which confirms the conclusions of Bonaccorsi and Piccaluga (1994) and Teece (1986; 2008; 2010).

Similar to most companies that adopt international practices for property protection doing so through their central office, located abroad, Brazilian companies are driven to organize their core patent from their own experience, a difficult task if based only on trial and error. Companies need support to answer the questions that are presented to them. Models such as those adopted by DuPont (Sterling & Murray, 2007), or the one proposed by Davis and Crawford (2006) may point to interesting directions for these companies.

The issues mapped in this study may represent an aid in the construction of models for the department of patents, which may make more agile and secure the process of protecting knowledge through patents, an activity not free of risks but considered potentially very profitable, as exemplify the international giants, DuPont, P&G, GM, Siemens (Arai, 2000; Teece, 1986; 2008; 2010; Sterling & Murray, 2007).

Although the sample size did not allow a significant statistical analysis, it was possible to examine the issues raised not purely on a basis of conjectures and opinions.

This article provides only a first approach on the subject. It adds to the qualitative research a quantitative research, but much more research is needed to better understand the problem posed by patent management, of clear interest for immediate implementation by companies and for the formulation of public policies intended to make easier the patent management, thus providing incentives for companies that internationalize their activities. As examples: in a more significant sample, to statistically investigate the relationship between the variables selected here by economic sectors, or by the intensity of innovation of the companies; investigate in companies that internationalized their activities, differences in the results of their patent offices measured at the beginning of the institutionalization of these offices and in the latest years, one of the values measured being, for instance, differences in the composition of the company assets. ♦

NOTES

- (1) The Patent Cooperation Treaty (PCT), established on June 19, 1970, basically specifies the international filing of patent and an international search. The filing of the international application shall be made in one of the **PCT** member countries, and such filing shall take effect simultaneously in other member countries.
- (2) The innovation mandatory disclosure for which the patent was applied and that is contained in this document.
- (3) Claim – specific indications listed in the patent application document, which specifies the points of innovation for which patent protection is required.

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ABSTRACT

Differences in the patent management in Brazilian companies with and without plants abroad

This paper compares the procedures of local Brazilian companies (those which have plants in Brazil only) with those of international Brazilian companies (which have plants in at least two countries) regarding the patent management. Although there are a lot more variables to consider when examining the issue of patents in companies, this study presents and analyzes the results of a qualitative research on the decision to patent innovations, the choice of countries where to patent and the strategic significance of patents to the company.

Keywords: patents, strategy, internationalization of companies, patent management.

RESUMEN

Diferencias en la gestión de patentes en empresas brasileñas con y sin plantas en el extranjero

En este artículo se comparan los procedimientos de empresas brasileñas locales (que sólo poseen plantas en Brasil) con los de empresas brasileñas internacionales (que tienen plantas en al menos dos países) en lo que concierne a la gestión de patentes. Aunque existan muchas más variables a considerar cuando se examina el tema de las patentes en las empresas, aquí se presentan los resultados de un estudio cualitativo en que se analizan la decisión de patentar las innovaciones, la elección de los países dónde patentar y el significado estratégico de las patentes para la empresa.

Palabras clave: patentes, estrategia, internacionalización de empresas, gestión de patentes.



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