

INTELLECTUAL PROPERTY IN THE POST GRADUATION OF NORTHEAST FEDERAL UNIVERSITIES: BIBLIOMETRIC INDICATORS

PROPRIEDADE INTELECTUAL NA PÓS-GRADUAÇÃO DAS UNIVERSIDADES
FEDERAIS DO NORDESTE: INDICADORES BIBLIOMÉTRICOS

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RESUMO: A análise da produção do conhecimento científico, através da bibliometria, permite avaliar o perfil de área específica. Neste sentido, este artigo apresenta os indicadores bibliométricos dos Programas de Pós-Graduação da região Nordeste que pesquisam sobre Propriedade Intelectual. Esta pesquisa classifica-se como exploratória, com abordagens quantitativa e qualitativa, tendo como campo de estudo: Universidade Federal da Bahia (UFBA), Universidade Federal de Sergipe (UFS), Universidade Federal de Alagoas (UFAL), Universidade Federal de Pernambuco (UFPE), Universidade Federal da Paraíba (UFPB), Universidade Federal do Ceará (UFC), Universidade Federal do Maranhão (UFMA), Universidade Federal do Piauí (UFPI), Universidade Federal do Rio Grande do Norte (UFRN). A coleta de dados foi feita na Base de Dados de Teses e Dissertações da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) e nos Repositórios Institucionais das instituições pesquisadas. Como estratégia de busca, utilizou-se o termo “Propriedade Intelectual”, que permitiu encontrar 4 (quatro) teses e 34 dissertações. Para organização dos dados foram utilizados os *softwares* Excel® e Word Art®. Com os resultados, foi possível identificar os Programas de Pós-Graduação que desenvolveram pesquisas em Propriedade Intelectual, as temáticas abordadas e as palavras-chave mais recorrentes. Dessa forma, foi viável traçar um panorama dos aspectos da pesquisa em Propriedade Intelectual através da construção de indicadores bibliométricos.

PALAVRAS-CHAVE: Propriedade intelectual. Bibliometria. Pós-Graduação.

ABSTRACT: The analysis of the production of scientific knowledge through bibliometrics allows the evaluation of the specific area profile. In this sense, this article presents the bibliometric indicators of the Postgraduate Programs of the Northeast region that research on intellectual property. This research is classified as exploratory, with quantitative and qualitative approaches, having as a field of study: Federal University of Bahia (UFBA), Federal University of Sergipe (UFS), Federal University of Alagoas (UFAL), Federal University of Pernambuco (UFPE), Federal University of Paraíba (UFPB), Federal University of Ceará (UFC), Federal University of Maranhão (UFMA), Federal University of Piauí (UFPI), Federal University of Rio Grande do Norte (UFRN). The data collection was done in the CAPES Thesis and Dissertations Database and in the Institutional Repositories of the researched institutions. As a search strategy the term "Intellectual Property" was used, which allowed to find 4 theses and 34 dissertations. To organize the data, Excel and Word Art software were used. With the results, it was possible to identify the Graduate Programs that developed research on Intellectual Property, the topics addressed and the most recurrent keywords. Thus, it was feasible to outline the aspects of Intellectual Property research through the construction of bibliometric indicators.

KEYWORDS: Intellectual property. Bibliometric. Postgraduate studies.

1 Introduction

The analysis of the scientific production resulting from the Graduate programs has been object of study in several fields of knowledge (CUSTÓDIO, 2012). Studies of this nature allow to verify the trends of areas, themes, institutions, researchers, collaboration networks, among other elements.

With the increase of Post-Graduation, consequently, there was the growth of the scientific production, in turn, generating new knowledge in diverse areas. Among the research produced in the academic world, especially in the Graduate Programs, are theses and dissertations, which are valuable instruments of scientific communication, evaluated by the peers.

In this sense, the researches with bibliometric approaches in theses and dissertations can contribute to identify the theoretical tendencies, on the studied subject, to identify the collaboration of the Graduate Programs for a certain area of knowledge, to delineate methodological tendencies, as well as to identify more authors cited. Such information may become relevant to researchers and research groups.

The researches developed in the universities be them academic, basic or applied, aim, mainly, to produce new knowledge. At the postgraduate level, at master's and doctoral level, the dissemination of scientific production can be done through theses and dissertations, as well as in scientific journals. These documents record the new knowledge, are credible, since they are evaluated by the pairs and give visibility to the results of the researches (CUSTÓDIO, 2012). It is not enough just to discover and build new knowledge, it is also necessary to have information on how, when and where knowledge can be protected, in order to generate new products.

It is in this context that Intellectual Property is inserted, due to its importance in the academic environment, since its premise is the protection of human creation, whether in the literary, artistic or scientific field. Based on the legal context and with relevance in the factor of competitiveness in the market, its disclosure is relevant for all areas of knowledge. With the advent of the Innovation Law in 2004, Intellectual Property has become more relevant in universities, due to the formation of the Innovation and Technology Centers (NIT's), which are the entities responsible for licensing, protection and transfer of innovations technological developments.

In this way, the objective of this work is to make a bibliometric analysis, in the theses and dissertations that approach Intellectual Property, aiming to contribute with bibliometric indicators of the scientific production in this subject, developed by researchers of the Post-

Graduate Programs of the federal universities of the Northeast region. It specifically aims to identify the Post-Graduate Programs that are researching, the areas of knowledge that are related, as well as the topics that are being most addressed in research on Intellectual Property. In this sense, this research is justified by the importance of understanding the dynamics of Intellectual Property with other fields of knowledge, as well as contribute to future research in bibliometric studies and contribute with indicators of scientific production on Intellectual Property.

The topics following this introduction contemplate the theoretical reference, which deals with bibliometrics, bibliometric indicators and Intellectual Property. After the theoretical reference, the methodology is presented, followed by the results and discussion, ending with the final considerations.

2 Bibliometrics and Bibliometric Indicators

Bibliometrics refers to the evaluation of the production of scientific knowledge, having emerged in the twentieth century as a technique used to quantitatively measure the indexes of scientific productivity (LOPES et al., 2012). Despite being widely used by Library Science and Information Science, researchers from several areas of knowledge use bibliometrics to explore the impact of science, in terms of production and dissemination, as well as the construction of indicators (MARCELO; HAYASHI, 2013).

According to Gorbea Portal (2016), as a metric specialty, bibliometrics allows us to identify the quantitative regularities that exist in the flow of documentary information and in the processes of production and scientific communication that operate in them. For Araújo (2006), bibliometrics contemplates the analysis of books, scientific journals, periodicals and theses, among other sources. It makes it possible to measure indices of production and dissemination of knowledge, as well as to evaluate the authors' productivity and to carry out citation studies through indicators.

As a contribution to the studies of bibliometric analysis, we have the classical laws of bibliometrics, which guide researchers in categorizing the focus of study and applicability. Guedes (2012) shows the authors of the laws and their relevance: the Bradford Law is focused on the analysis of the productivity of journals, allows to analyze the relevance of journals in a certain area of knowledge. Lotka's Law relates to studies of authors' scientific productivity, emphasizing that researchers of greater influence produce more, and researchers with less influence produce less in a given area of knowledge. In the Law of Zipf, it is possible to evaluate the frequency occurrence of a given word in a text, being related to thematic indexing.

With regard to bibliometric indicators, Lopes et al. (2012) classify: Scientific quality indicators for peer content evaluation; Indicators of scientific activity, related to the quantification of the activities developed; Indicators of thematic associations, which are the analysis of citations and references; Scientific impact indicators, which are divided into two types, the impact indicators of the works, focused on the analysis of the number of citations received and the other type concerning the impact indicators of the sources, which analyze the impact factor of the journals, the index of citations and the influence of the journal. According to Mugnaini (2018), despite the importance of the evaluation of scientific research, the impact indicators (based on citation) are understood as complementary, not discarding the need for a more exhaustive investigation.

The analysis of scientific knowledge through reliable indicators allows to verify the growth of different areas of knowledge, the visibility of scientific production, authors, institutions and countries. Its results can help in decision making for investment in science and technology (ALVAREZ; CAREGNATO, 2017).

It is evident how much bibliometrics brings possibilities for the evaluation of science. Pimenta et al. (2017) point out that bibliometrics is of fundamental importance for the investigation of scientific production by virtue of its attributes, since it aims at pointing out study metrics, identifying topic reduction, measuring citation impact, as well as verifying scientific production in the academic environment. It also enables the visibility of the new sources of information, through analysis in patents, theses, dissertations and other scientific research publications.

2.1 Intellectual property: definition and scope

According to the World Intellectual Property Organization (WIPO) convention, Intellectual Property (IP) refers to any creation of the human mind in all areas of knowledge, whether in the scientific, technological, artistic or literary environment. It deals with the right of protection of inventions in all fields of human activity, giving the inventor the guarantees and possibilities of rewards for the recognition of creation (WIPO, 2016). Campos and Denig (2011) complement that the results of intellectual activities are recognized as intangible assets, that is, assets based on knowledge.

For Speziali et al. (2016), PI is characterized as a legal instrument, to protect the knowledge coming from human creation, in the technological, artistic and literary aspects. In addition, it can stimulate countries' socio-economic advancement if they have successful IP management, as well as impact the dynamics of the economies of nations.

In terms of scope, IP encompasses three main areas: copyright, industrial property and *sui generis* protection. Each of these segments has specific legislation regarding their form of

protection, because they have different natures (UFS, 2017, JUNGSMANN, BONETTI, 2010).

Copyright is regulated by Law No. 9.610/98, which consists of the protection of intellectual works in the literary, scientific and artistic fields, such as: drawings, paintings, sculptures, books, conferences, scientific articles, journalistic materials, music, films, photographs, software, among others (BRASIL, 1998). It covers copyright, related rights and computer software.

Industrial Property, regulated by Law 9279/96, has a greater focus on industrial, technological and commercial activity (SPEZIALI et al., 2016). It involves rights over patents, industrial models, trademarks, repression of unfair competition.

Sui generis protection, a lesser known area of protection in Intellectual Property, involves integrated circuit topography, cultivation, traditional knowledge and access to genetic heritage, each type of protection being regulated by specific law, as well as the determination of protection periods. (UFS, 2017, JUNGSMANN, BONETTI, 2010).

3 Method

This research is classified as exploratory, with qualitative and quantitative approaches. As for the procedures adopted, the research was based on the bibliometric technique, considering that it allows the analysis in books, scientific journals, periodicals, theses, dissertations among others, through statistics and mathematical techniques, for the construction of indicators that represent the dynamics of a certain area of scientific knowledge (ARAÚJO, 2006; LOPES, 2012; MARCELO; HAYASHI, 2013).

The study field was formed by nine Federal Universities of the Northeast Region of Brazil, following: UFAL, UFBA, UFC, UFMA, UFPB, UFPE, UFPI, UFRN and UFS.

As for the data collection instruments, they were collected through access to the electronic site of the Brazilian Digital Library of Theses and Dissertations (BDTD) of the Brazilian Institute of Information in Science and Technology (IBICT) and Institutional Repositories (IR). The choice of these sources was due to the fact that they provide updated scientific information, with national coverage.

The BDTD was developed and is coordinated by the IBICT, aims to integrate the information systems of theses and dissertations of higher education institutions, and to provide researchers with a catalog with full text. The data are provided by the defense institutions, which also have their BDTD (IBICT, 2018).

IRs were developed by the IBICT-FINEP/PCAL/XBDB project. They are online

databases that bring together the scientific production of an institution, providing greater visibility to the results of research and enabling the preservation of the scientific memory of its institution (IBICT, 2018).

The search strategy for data collection in both databases was made through the term "Intellectual Property". In the BDTD, the research was carried out in advanced search, filtering the option subject, type of document and the year of the defense. From then on, a survey was made in the institutions that were part of the research. In the IRs, the search was constituted selecting the most convenient community, because in each institution the repositories have specific communities; then the subject field was chosen.

After the data were collected, they were organized in Microsoft Excel® software, in which the tables and graphs were elaborated to visualize the results. The variables highlighted for data measurement were: Qualification level, Year of defense, Institution, Postgraduate Program, Keywords. These variables allowed to build the profile of the scientific production of Intellectual Property, responding to the objectives proposed in this research and the construction of the indicator measures of production.

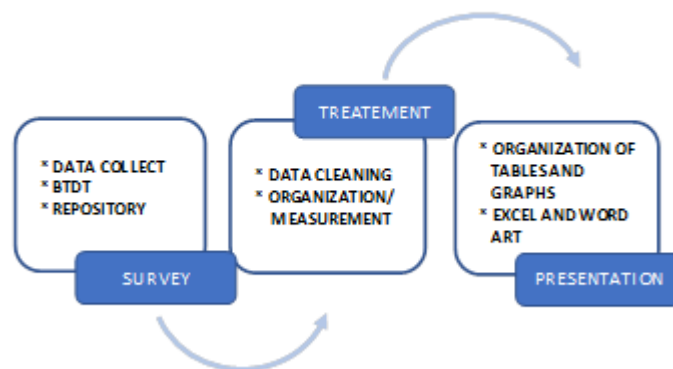


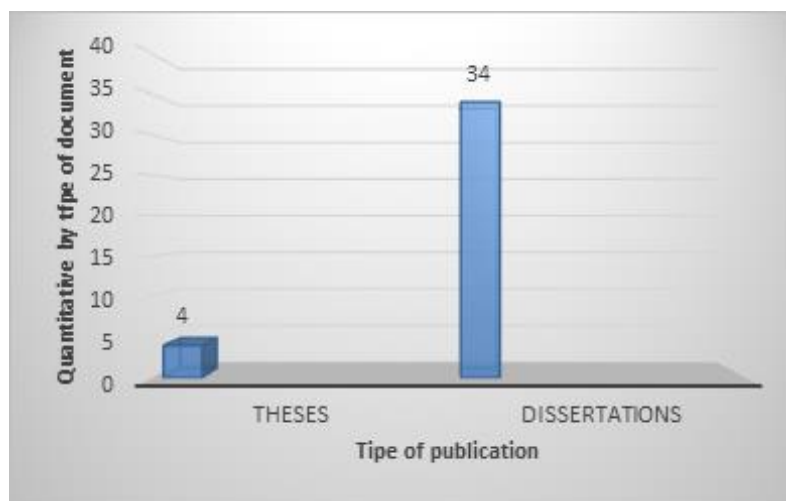
Figure 1. Flow of data collection, treatment and presentation
Source: Authors' elaboration

4 Results and Discussion

In this section the bibliometric analyzes of the indicators of production measurement will be presented, whose variables are: Qualification level, year of defense, institution, Postgraduate Program and keywords. The data were collected until February 2018, and a total of 38 papers were found. Based on this survey, the variables that were proposed in this

research will be analyzed, so that the bibliometric indicators of the scientific production on Intellectual Property can be delineated and analyzed.

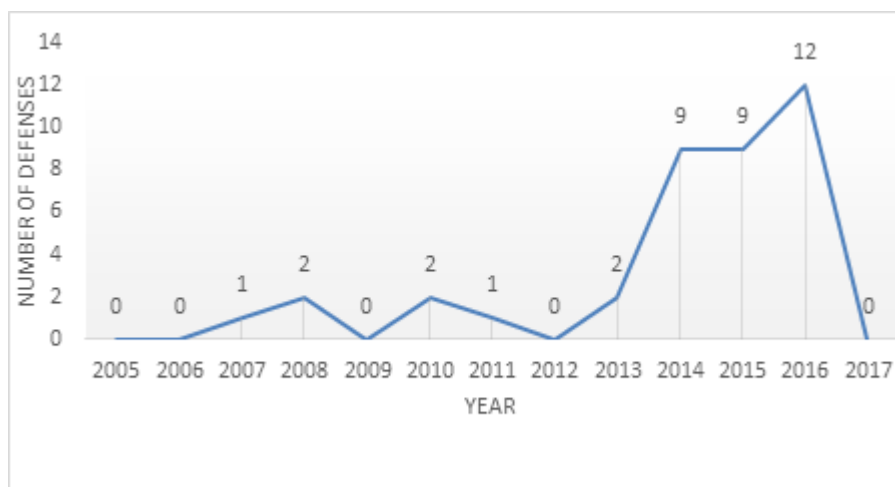
Graph 1 shows the distribution of the works in relation to the type of publication; four theses and 34 dissertations were identified, of which five are from professional masters. This quantitative allows to observe that the master's degree overlaps the doctorate with respect to the researches in Intellectual Property.



Graph 1. Quantitative by type of publication

Source: the authors, field research.

Regarding the temporal distribution of publications, in the period between 2005 and 2017, it can be seen from Graph 2 that defenses began in 2007, with only one work. There was variation regarding the number of defenses in the analyzed period; however, as of 2014, the quantitative value was higher. The period with the greatest number of papers defended was between 2014 and 2016. The first work defended was a dissertation of professional master's degree at UFBA, entitled: "**The protection and exploitation of intellectual property in the university environment: the role of development governmental agencies.** "

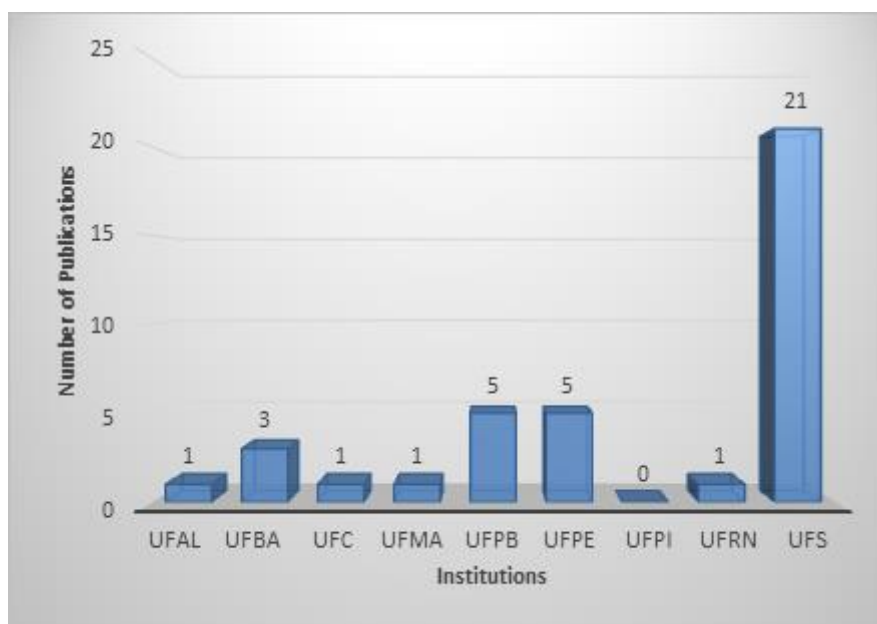


Graph 2. Annual distribution of the defenses of Dissertations and Theses

Source: the authors, field research.

With regard to the amount of research per institution, of the nine Universities presented in Figure 5, it is observed that only the Federal University of Piauí (UFPI) does not have any research focused on the subject. The Federal University of Sergipe (UFS) holds the highlight, with most defenses, presenting 21 papers. It is worth noting that UFS is a prominent institution because it offers the Post-Graduation of Intellectual Property Science at master's and doctoral level. Next, the UFPB and UFPE stand out, both presenting the same quantitative, with five works defended. The Federal University of Bahia (UFBA) presents three papers, the other Universities: Federal University of Alagoas (UFAL), Federal University of Ceará (UFC), Federal University of Maranhão (UFMA) and Federal University of Rio Grande do Norte only present one job each.

It is worth mentioning that the research defended at UFS was carried out in only one Program, the Intellectual Property Science Program, while the research carried out at the UFPB, three are from the Information Science Program, the other two works are from the Administration Program. The researches defended in the UFPE are of distinct Programs, each research being defended in a different program: Computer Science, Therapeutic Innovation, Economy, Foreign Trade and Development and environment.



Graph 3. Distribution of Defenses by University

Source: the authors, field research.

With regard to research carried out by Graduate Programs, it is verified, through Graph 4, that 14 programs are contributing to research, in areas other than knowledge. According to the data presented, it can be inferred that Intellectual Property is a topic that arouses interest in fields other than knowledge, which makes it possible to show that it is an interdisciplinary area between the sciences, for the construction of new knowledge.

In addition to the Intellectual Property Science Program, which presents 21 papers defended, the Administration and Information Science Programs excel at the others, with three works each. The other 11 papers were defended in 11 different programs, as can be inferred from the graph below.



Graph 4. Distribution of Defenses by Postgraduate Program

Source: the authors, field research.

To better illustrate the above, about the contribution of programs with the research in IP, Figure 2 shows the interaction of Intellectual Property with the programs that researched this topic. There are 14 Post-Graduate Programs that are contributing to the development of science in Intellectual Property.

The map shows a convergence, in which all programs are concentrated in the periphery, presenting links of research collaboration with Intellectual Property, which in turn focuses on the center. It is possible to perceive the robustness of the connection line between the Science of Intellectual Property, which indicates that there is more scientific production in this Program. Then, one can see more prominence in the lines in Information Science and Administration.

As for the areas of knowledge, it is verified that half of the programs presented are part of the area of Applied Social Sciences; secondly, are the programs coming from the area of Human Sciences.

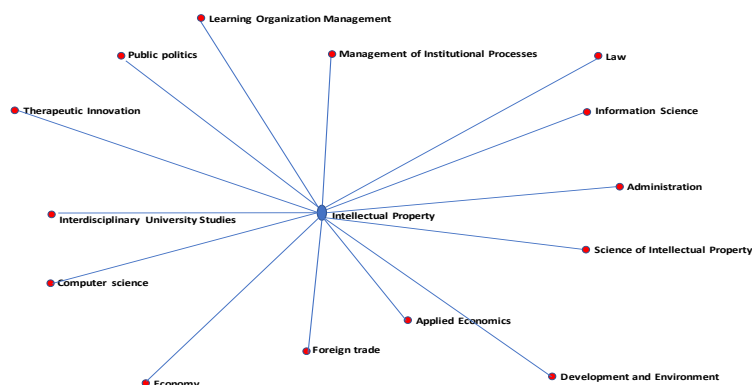


Figure 2. Contribution of the Postgraduate Programs for Science in Intellectual Property
Source: the authors, field research.

In order to identify the most recurrent terms in the Dissertations, the keywords used by the authors were evaluated. In the 34 Dissertations, 124 keywords were found, approximately an average of 3.6 per work.

Figure 3 shows the key words in the Dissertations that are highlighted, that is, the terms reveal their frequencies proportionally to the visual highlight. The more prominent the term in the cloud, the higher its frequency. It is observed that the term Intellectual Property was the most outstanding, followed by Copyright, Indicators, Patents, Innovation and etc.

The analysis of frequency of occurrence of words is related to the Law of Zipf, which relates to the correlation between the frequency of a word in the text and the position it occupies. The position was established by Zipf as a result of a serially organized list containing the word rank. The most cited words are given the series order one and the other orders are sorted according to the frequency of the words. Thus, he observed that the product of the serial order of a word by its frequency was a constant (GUEDES, 2012).



Figure 3. Highlighted key words of Dissertations
Source: the authors, field research.

private banking agencies, how much this protection impacts on the results of these organizations, from the increase of the value of its brand to the attraction of new investors and in the relationship of customer satisfaction.

b) Patent Research and Technological Innovation:

As for the contribution of research on patents and technological innovation, we can find in Acioli's (2015) research the patenting of pharmaceutical industries in Brazil, whose objective was to analyze patent applications filed with INPI by the companies that lead the market in this sector, as well as to analyze the indicators that categorize trends and strategies.

Cruz (2016) presents a mapping of technological studies on the use of nanotechnology in medical treatments, with the objective of verifying the growth of patent deposits and the existing gaps in this area in Brazil. He noted that the number of patents has been developing in Brazil and in Europe.

The research carried out by Dall'Agnol (2015) presents a parallel of the Intellectual Property in the Brazilian Armed Forces, Navy, Army and Aeronautics regarding the patent deposits and the policies of creation of its Technological Nuclei. It was verified that the Brazilian Air Force has the largest number of patents and the Army is the one that deposits the least.

In the text of Garcez Junior (2015), the patent applications pending at INPI are evaluated and shows alternatives for stock reduction.

Oliveira (2014) presents contributions through his work, whose objective was to carry out a technological mapping, to verify the control and combat of bovine brucellosis, as well as to evaluate the eradication in the state of Sergipe.

c) Researches that address Technology transfer and IP in universities:

With regard to research on technology transfer in universities, the connections between companies and universities can be seen in the Thesis of Fabris (2016), whose objective was to construct and validate a model to analyze how and why Enterprise-University connections occur.

In the Moura (2015) research, it was analyzed how the protection of Intellectual Property works in higher education institutions in the Northeast region, more specifically if and how Intellectual Property contracts exist.

In the research of Pires (2016) a case study was developed at the Federal University of the Recôncavo of Bahia, aiming at mapping and proposing strategies to intensify the protection of Intellectual Property and the transfer of technology.

We have in Souza (2016), patent valuation models, whose objective was to investigate the trends of research and the methods of valuation of patents in the most important Brazilian public universities, in order to demonstrate the performance of the universities regarding the deposit of application.

Other topics were addressed in the Dissertations, which are added as contribution to the area of Intellectual Property: Teaching IP, developed by Tommasi (2015); on Geographical Indication we have the Dissertation of Brandão (2016); the Measurement of scientific production can be seen in the research developed by Menezes (2016); Aspects about the social function of IP can be observed in Lima's research (2016); the Management of Intellectual Property was the subject of Silva's Essays (2014) and Loureiro (2016); about Cultivares, we have the contribution of the research of Borges (2014).

5 Final Considerations

According to the proposed objectives and based on the results presented, it is evident that Intellectual Property has been the subject of research in the Federal Universities of the Northeast Region.

Regarding the variables that constituted the production measures indicator, after the bibliometric analysis, we have on concerning the academic level, the master degree as predominant in the researches on Intellectual Property, with 34 works, while the doctorate presented four researches. The period when there were more defenses was from 2014 to 2016.

Regarding research by institution, the Federal University of Sergipe stands out with 21 papers, representing 55.3% of the quantitative of 38, between Dissertations and Theses, since it projects the State of Sergipe in the first place in the Northeast Region.

As for the Graduate Programs, of the 14 presented the Graduate Program in Intellectual Property Science, the Federal University of Sergipe was the most prominent in the research on the subject, followed by the Programs in Information Science and Administration.

With regard to the themes addressed, Programs from different areas of knowledge are contributing to the science in Intellectual Property, and it can be inferred that there is an interdisciplinary interaction between the areas. It is worth highlighting the most discussed topics: Trademark registration; Patents and Technological Innovation; Transfer of Technology and IP in Universities; Copyright and Geographical Indication.

The frequency analysis of the keywords showed that the most recurrent term was Intellectual Property, both in Theses and Dissertations; other commonly used terms were: Patents, Innovation and Copyright.

This study opens perspectives for several analyzes, so that more indicators can be identified with the possibility of exploring other paths of research in Intellectual Property. These indicators will allow to point out contributions in the field of Intellectual Property for science.

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