

Analysis of Intellectual Property Assets in A Local Innovation System on The Rise: The Case of Pernambuco

Janaína Galdino de Barros

Programa de Pós-Graduação em Ciência da Propriedade Intelectual
Universidade Federal de Sergipe, Brazil

Ana Eleonora Almeida Paixão

Programa de Pós-Graduação em Ciência da Propriedade Intelectual
Universidade Federal de Sergipe, Brazil

Abstract

The intellectual protection process is a sine qua non condition for leveraging a system based on a specific location. The purpose of this article was to find a referenced chronological survey - 2000 to 2017 - on the relationship of fostering innovation and Intellectual Protection, according to the usability of certain assets in view of the Local Innovation System in Pernambuco - Brazil. The methodology used was descriptive, with documentary analysis and bibliographic references. As a result, it was found that there is a structural disorder in Intellectual Property in the state, taking it to levels far below other Local Innovation Systems with the same innovative maturity. A developmental and intellectual property gap was found in what is already considered one of the largest and best structured Brazilian Local Innovation Systems. Considering these unsatisfactory results, it is necessary to promote in the Pernambuco Local Innovation System innovative matrix methods and Intellectual Property capable of taking the referred state to innovative levels never thought of.

Keywords: Local Innovation System, Intellectual Property, promotion.

I. INTRODUCTION

1.1 Innovation

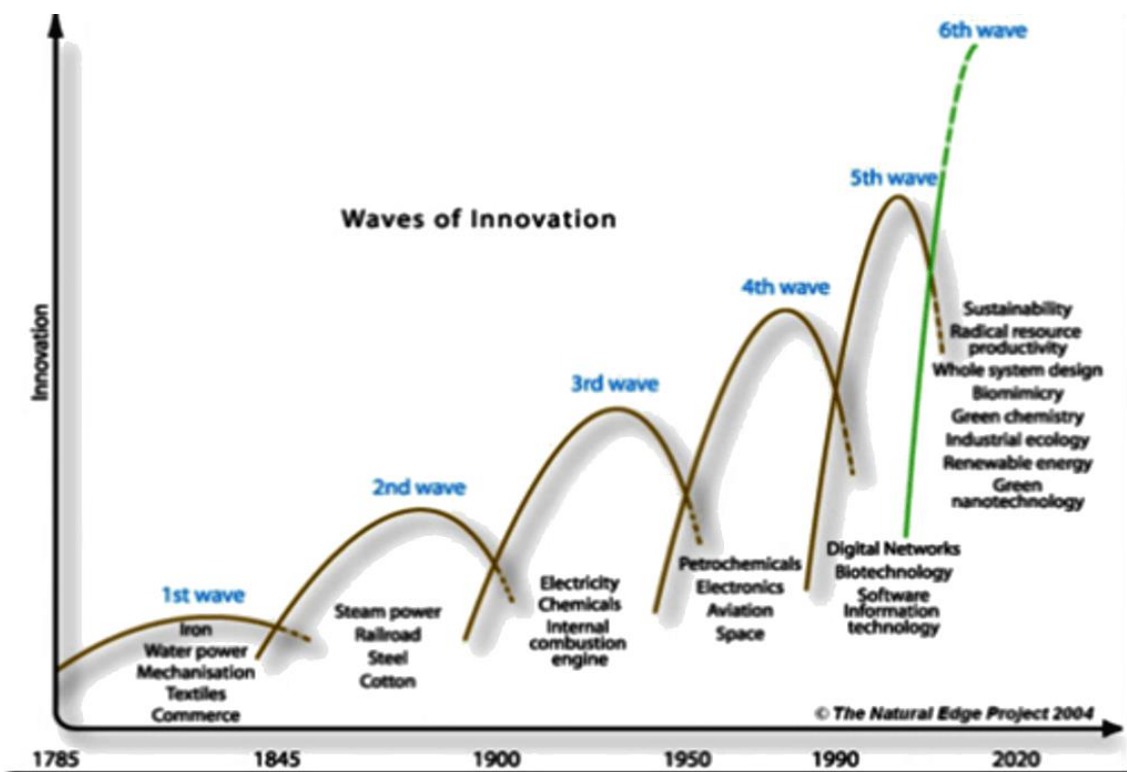
The process of maturing local innovation ecosystems permeates important areas and makes a particular location a precursor to innovation and development in a given region. As a general objective, this manuscript intends to demonstrate a chronological survey - 2000 to 2017 - on Intellectual Property assets - PI and the relationship of fostering innovation and Intellectual Property, according to the usability of certain assets in relation to the Local Innovation System Pernambucano.

Intellectual property protects all assets developed based on good ideas from entrepreneurs inserted in Ecosystems. Many authors are developing concepts about innovation and innovation ecosystems worldwide, see: The conception of innovation as the result of an interactive process of accumulation of institutional knowledge has its roots in experiments that were initiated and carried out in England, at the

University of Sussex, conducted by Professor Chris Freeman, and in the United States, at Yale University, who “demonstrated the extreme importance, for innovation, of the accumulation of internal skills, fundamental for companies to interact with the external environment”(CASSIOLATO; LASTRES, 2005, p.35). According Freeman (2005) Lundvall (2001); Nelson & Winter (2005), the concepts of innovation were discussed by the Austrian Economist Joseph Schumpeter. From these discussions and, based on their concepts, the Neoschumpeterian School of Economic Thought originated. One of the first authors responsible for the insertion of the concept of innovation is Joseph Schumpeter, who is known as the author responsible for inferring that the activities that lead to cycles of expansion and chartering of the capitalist system and of the organizational processes justify the success or failure of the innovative processes. Schumpeterian Theory explains that the long cycle of study focused on organizational innovations has its main role as an inducer of economic growth. Schumpeter safeguards that competition funnels the entrepreneur's desire to seek new ways to increase technology, new ways of doing business and other types of competitive advantages that could increase profit margins and directly impact the entrepreneur's standard of living. (SCHUMPETER, 1997). Schumpeter also infers that Schumpeterian dynamics has a dialectical character, the boom brings with it the elements that will cause a rupture in the technological pattern hitherto in force, make companies or even entire segments obsolete and lead the economy into recession. On the other hand, new waves of innovations appear and negate the old paradigms of the technological standard, initiating a new cycle of prosperity.

According to the quote above and, taking into account the figure below, it is notorious to realize that there are several types of innovation and that these disruptions occur within the innovative processes in innovative waves / layers.

Figure 1 - Schumpeterian Waves of Innovation



Source: Adapted. Schumpeter, 2015

The figure above leads us to believe that local innovation products / processes / systems go through innovative cycles. The useful life of a cycle is fed back from a new innovative paradigm of the period that is about to start, that is, that bold prerogatives that a company can face in the midst of national crises and innovative strategies can indicate the direction taken through bold dynamics, capable of fostering innovation and standing out in traditionalist environments.

1.2 Intellectual Property

Scientific and technological innovation gained a protective asset capable of generating resources for the subject to safeguard his inventions. The concept of Intellectual Property in Brazil it has its origin in the initial framework of intellectual property, through decree no. 635, of August 21, 1992, whereby the country adopted international agreements that allowed Intellectual Property to have a unique title in global terms, namely Trademarks and patents (Law No. 9279/96), Cultivars (Law 9456/97) and Copyright (Law No. 9610/98). This is a movement to position Brazil on the international stage, with implications for world trade. International conventions and agreements, such as TRIPS (Trade Related Intellectual Property Rights) are decisive in this new positioning (RUSSO, 2016). The recognition of Brazil and the conception of the aforementioned decree inserted the country in a unique situation, capable of making businessmen / entrepreneurs - owners and, strategically, effective intellectual property assets - able to preserve their businesses, in order to enjoy only innovative products / services / processes. Also in line with the understanding of Intellectual Property, the concept of patents runs through relevant indicators to assess the country's ability to transform scientific knowledge into products or technological innovations (Ministry of Science, Technology [s, d], these can be used as a knowledge base for both acquisition and technology transfer. (SANTOS, et al, 2014). The merit of Intellectual Property in the world was assessed in the Paris Convention for the protection of Industrial Property (1883) and in the Berne Convention, for the protection of Literary Works and Artistic Works (1886), the two administrative treaties being validated by the World Health Organization. Intellectual Property - WIPO (WIPO, 2016). Second HUDSON and MINEA, 2013, The World Trade Organization (WTO), along with other international institutions, has been emphasizing the crucial role of Intellectual Property Rights (IPR) as a catalyst for innovation and economic-cultural development worldwide. It starts from the assumption that Local Innovation Systems need to have a greater understanding of Intellectual Property assets - IP, capable of working policies to protect what is generated, innovative and proposed as protection to intellectual knowledge.

1.3 Innovation Ecosystems

There are several authors discussing the concept of Innovation Ecosystems. One of the first concepts related to the theme is TEIXEIRA, TRZECIAK & VARVASKIS, 2017. The authors consider that a Local Innovation Ecosystem infers that the concept is the same that leads to reflections and comparisons with the concept of biological ecosystem. A biological ecosystem can be defined as a set formed by the interactions between biotic components, such as living organisms - plants, animals and microbes - and abiotic components, chemical and physical elements - such as air, water, soil and minerals. Still for TEIXEIRA, TRZECIAK & VARVASKIS, 2017, *Biological Ecosystems refer to complex sets of relationships between living resources in an area that aimed to maintain a state of sustainable balance. Innovation Ecosystems,*

in turn, are responsible for shaping the economy, instead of complex biological relationships, and their functionality is linked to the viability of the development of innovation, with social repercussions. As an important part, this manuscript intends to carry out a thorough survey on the promotion of innovation and IP assets for a rising local innovation system. It starts from the premise that the Local Innovation System - SLI Pernambucano, being very developed and internationally recognized, can use this knowledge to protect its technological and entrepreneurial innovations through Intellectual Property assets.

1.4 Pernambuco's Innovation Ecosystem.

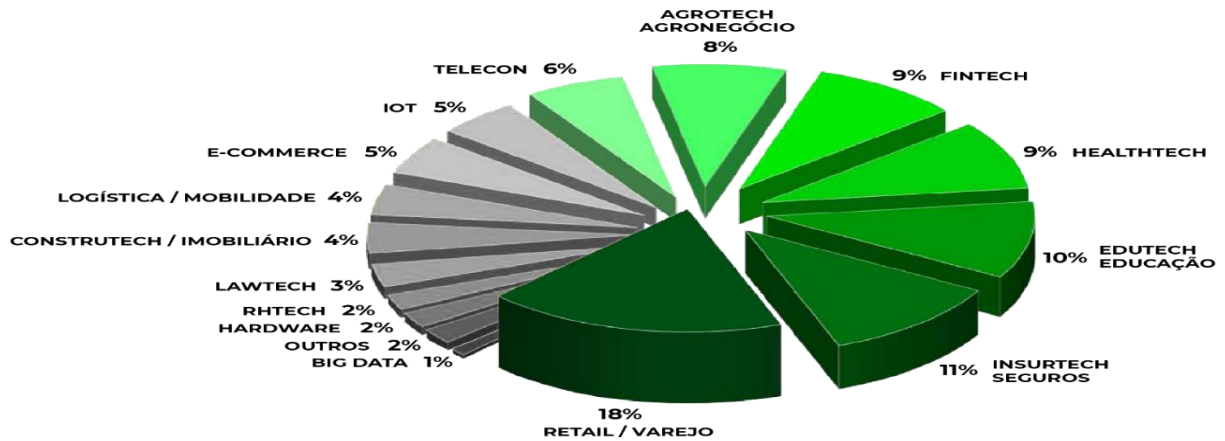
The grandeur of Recife's local innovation ecosystem is notorious with the implementation of Porto Digital. Created in 2000, the park arose from the need to implement a public policy for the development of the Information Technology and services sector in Pernambuco. After its inauguration, Pernambuco felt the need to have a new agenda for the state. Like this, businessmen, members of the academy and representatives of the public sector decided to take to the state government the idea of creating a public policy for the Information and Communication Technology (ICT) sector that would link actors, companies and organizations that until then acted independently and in isolation (PORTO DIGITAL, 2017).

In this sense, the state government obtained an investment of around 33 billion - which was the amount needed to support the base of the Technological Park. The private sector - particularly Telecommunications - made an investment of R \$ 1 million in structures and other private companies contributed more than R \$ 10 million. It was enough to leverage the developmental culture of the state of Pernambuco. In addition to the entire financial and cultural apparatus, the Technological Park also has the Recife Center for Advanced Studies and Systems - CESAR, a private innovation site and several branches spread throughout the Brazilian territory. Porto also has CESAR Scholl, the set of companies that are part of Porto Digital had revenues of approximately R \$ 1.7 billion in 2017. The Technological Park today brings together more than 9,000 highly qualified professionals, 800 of whom are entrepreneurs. Porto Digital has already attracted dozens of companies from other regions of Brazil do Recife, in addition to several multinationals and technology centers. Now, with the territorial expansion to the neighborhood of Santo Amaro, Santo Antônio and São José and the interior of the State, the expectation is that by 2020 around 20 thousand people will work in companies embedded in the technology park (PORTO DIGITAL, 2017).

The last survey carried out by the organization Desenvolve.al and Ecosystemas.PE, 2020, which aimed to get to know the companies that are part of the Pernambucano innovation ecosystem, points out that, according to Pierre Lucena, president of Porto Digital, "The Ecosystem.PE it will serve as a starting point for participation in open innovation and matchmaking programs, as well as other actions offered by the main actors of the hubs. After all, in addition to being a tool for the ecosystem itself, it is also a portfolio of what we, as a technology hub of national and international relevance, can offer. "

The referred document (2020) identified a number of 190 technology companies and Startups; 25 Research and Development Centers, 23 Junior companies, 11 coworkers and 7 business incubators, in addition to 3 accelerators in the state of Pernambuco. (Pernambuco Ecosystem Innovation Mapping, 2020). This number only leads one to believe that there is a growing maturity of the referred SLI, capable of strongly boosting the solidification of the bases that form its ecosystem. Let's see where the technology companies and Pernambuco Startups are located:

Figure 2 - Startups and Technology Companies in Pernambuco



Source: /// Mapping the Pernambuco Innovation Ecosystem, 2020.

It is clear in the figure above that the Pernambucano Ecosystem is diversified with service, products and processes, capable of making this location the largest ecosystem in the country. It is necessary to analyze whether or not there is innovation in these products, services and processes and whether such inputs are protected by intellectual property assets.

Still in the state of Pernambuco, there is Porto Digital, with tentacles - Advanced Units - in several municipalities, among which, a large develop mentalist municipality in the state - Caruaru. The municipality of Caruaru is a rural region in the state of Pernambuco, 135 km from the capital (SANTOS, SCHIMIDT & ZEN, 2016). According to the Brazilian Institute of Geography and Statistics - IBGE, 2016, the municipality of Caruaru is focused on services and there is an estimate that the sector has an investment of 82% of the municipality's annual GDP at the expense of 17% of the industry against just 1% of Caruaruense agriculture. According to the State Agency for Planning and Research of Pernambuco - CONDEP FIDEM, 2016, the city of Caruaru has an estimated GDP of R \$ 3.87 billion, the fifth largest in the state, with 315 thousand inhabitants, with an estimated 27.5% of the population being employed. Armazém da Criatividade is an innovative hub from Porto Digital, located in the city of Caruaru and whose main objective is to foster the development of the ecosystem for the development of creative economy Startups, allowing experimentation, prototyping and exchange of ideas among entrepreneurs (SANTOS, SCHIMIDT & ZEN, 2016). The Armazém da Criatividade de Caruaru opened its doors in 2015 and performs, excellently, its functions in order to leverage and develop the local innovation ecosystem of Caruaruense. It is assumed that a Local Innovation System must have several attractions so that its actors can think about strategies and develop them, in order to positively impact the locality, as well as use Intellectual Property assets taking into account the promotion of SLI Pernambucano.

II. Materials and methods

2.1 Methodology

Methodology is the logical branch / mechanism of recognized rules for performing a search. In this manuscript, the method used to carry out this research was descriptive, through a bibliographic and

documentary survey of various events related to the state's innovative development, in addition to works on the Local System of Innovation and Intellectual Property.

III. Results and Discussion

3.1 Patent Analysis of Pernambuco's Local Innovation System.

The process of granting a patent takes a relatively high average time to the detriment of innovation and commercialization of a product / process / service. For a rising ecosystem, it is necessary that most of the actors involved in the community have knowledge and practice the Intellectual Property assets - PI, capable of promoting and being responsible, nowadays, for most of the value generated by modern companies, especially in the more dynamic segments, those referring to products differentiated by brands and other badges, design and technological or authorial content. (BOLETIM RECIFE, 2015). Below, we will discuss the number of Brazilian States with the greatest representativeness in the total number of patent grants in the period between the years 2000 to 2012, according to the Bulletin of Indicators in Science and Technology and Innovation: Patenting Activities in Brazil and in the State of Pernambuco, Recife, August 2015

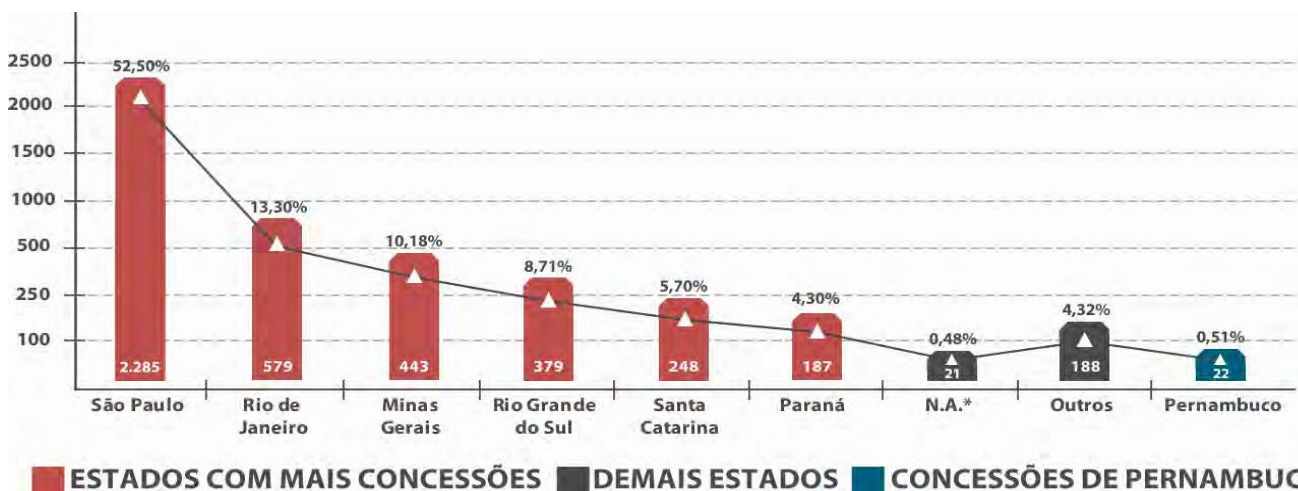


Figure 3 - Brazilian States with greater representativeness in the total number of patents granted for invention in a period between the years 2000 to 2012

Source: INPI Statistical Yearbook of Industrial Property, extracted in August 2020

It is possible to see that entrepreneurs in the State of Pernambuco need to understand better about Intellectual Property, given that the largest patent concessions are concentrated in the states of the South / Southeast of the country, representing almost 96%. The other states, like Pernambuco, add up to the rest. It is based on the assumption that the general objective of this article is to make an analysis of Intellectual Property assets in a rising Local Innovation System, in this case, Pernambuco. As is well known, IP assets can accelerate the maturation of the Local Innovation System in Pernambuco, making it more competitive and fierce in the global market.

With regard to the representativeness of Brazilian states in the granting of patents for invention between the years 2000 to 2012, there is strong evidence that the average granting of deposits by states is 7.84% while in the state where there is a Local System of Rising Innovation, the number is 3.25% approval, which

makes the state with very little expressiveness in comparison to the number of patents deposited, at the time, by the entrepreneurs / subjects, according to the figure below:



Figure 4 - Comparison of patent grant and deposit

Source: INPI Statistical Yearbook of Industrial Property, data extracted in August 2020.

With specific reference to the state of Pernambuco and its municipalities, the graph below depicts the progress of the granting of patents required in the years 2000 to 2012, according to the Statistical Yearbook on Industrial Property,

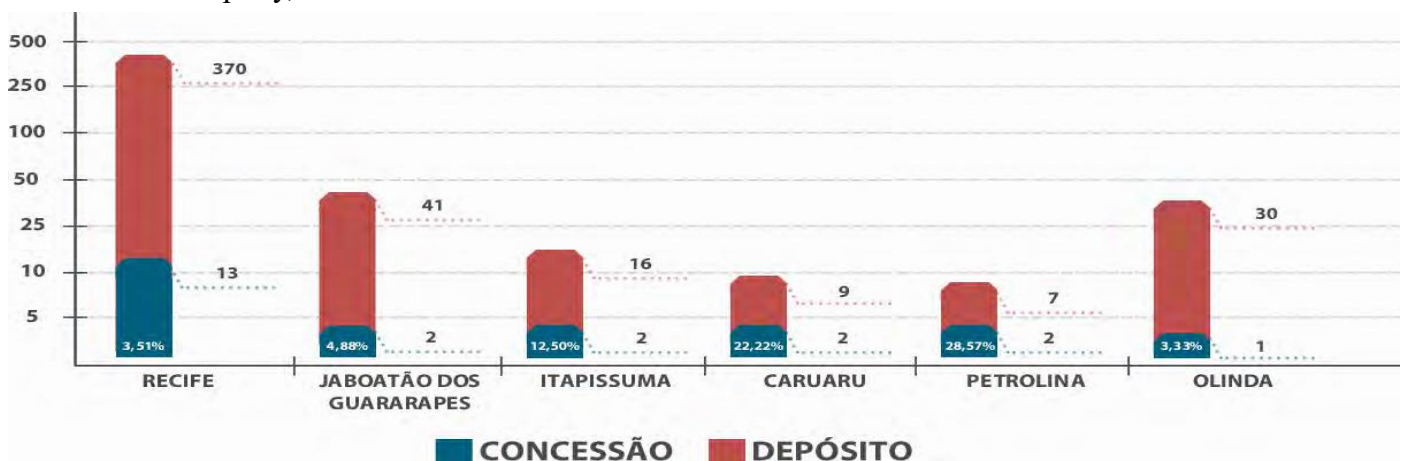


Figure 5 - Progress in the granting of patents required in the years 2000 to 2012.

Source: INPI's Statistical Yearbook of Industrial Property, extracted in August 2020.

It is noticeable that the deposit-concession ratio, which is too low, to be considered a good patent determination, taking into account that the Local Innovation System in Pernambuco was already considered to have one of the best developed Technology Parks - Porto Digital - according to FINEP, however without visibility of Intellectual Property.

With respect to the various R&D institutions, the figure below shows the number of depositors in the state of Pernambuco regarding the chronology between 2006 and 2014, according to the National Institute of Industrial Property.

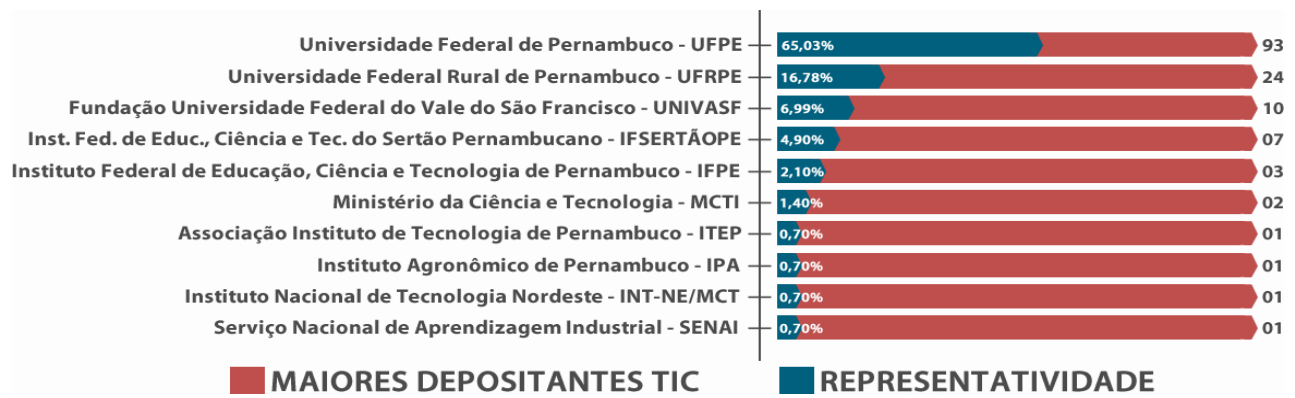


Figure 6 - Largest depositors by Education and Research institution in the State of Pernambuco for January 2006 to May 2015.
Source: (INPI / July 2015)

Source: (INPI / July 2015).

According to the graph above, Pernambuco's Higher Education Institutions account for 88.06% of deposit requests than other state education and research institutions. This data reminds us that many of the institutions do not have patent applications and / or do not know about Intellectual Property assets or do not yet have knowledge of the importance and promotion of IP assets.

Regarding the filing of patents from legal entities in the state of Pernambuco, considering that the percentage of patents from companies in the state is much lower to the detriment of the graph of depositors for Education and Research for the years 2006 to 2015, it is worth noting that there is a mismatch conceptual between higher education institutions and the business environment to which the state of Pernambuco is inserted. It is necessary to further study the knowledge about the State's Intellectual Property assets, capable of mapping the promotion and / or lack thereof regarding Public Policies aimed at corporate Intellectual Property and Startups, which are so important vectors for the solidification and maturation of its Ecosystem.

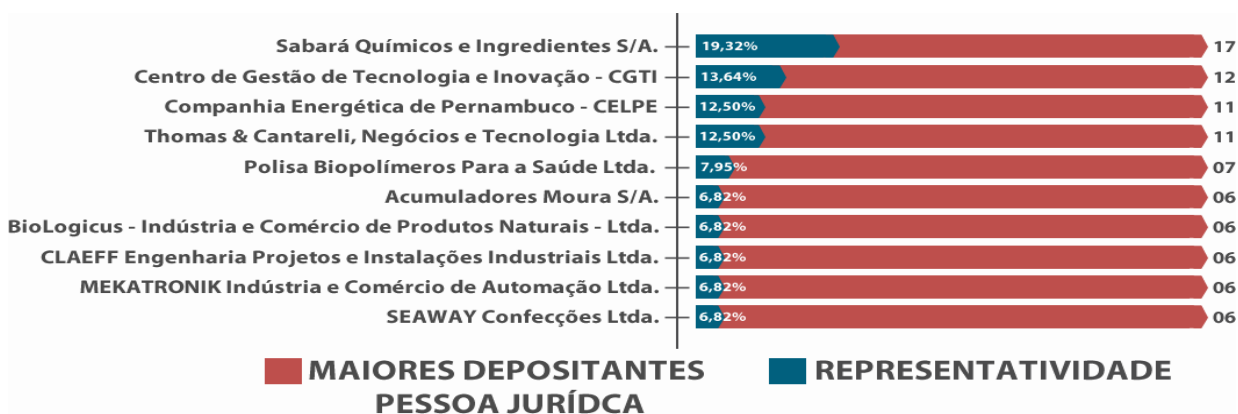


Figure 7 - Largest depositors per legal entity in the State of Pernambuco in the period from January 2006 to May 2015.

Source: (INPI / July 2015).

IV. Conclusion

According to all the understanding about this manuscript, the general objective was to demonstrate a chronological survey - 2000 to 2017 - on the Intellectual Property assets - PI and the relationship of fostering innovation and Intellectual Property, according to usability certain assets vis-à-vis the Local Innovation System in Pernambuco. Many works and / or documents were used as references, in order to mark this instrument that brought up important information about the understanding and promotion of public policy based on Intellectual Property in one of the best structured and recognized Local Innovation System in the Northeast. It is based on the assumption that there is still a lot to spread about the IP concept and assets so that SLI Pernambucano gains even more competitiveness compared to Intellectual Property assets. It was found that there are 190 technology-based companies and Startups in the state, where a technological harmony is understood throughout the Pernambuco territory, in addition to a structuring force in its SLI, such as a number of 25 Research Centers, 23 Junior companies, 11 coworkings and 7 business incubators, in addition to 3 accelerators, where the Local Innovation System is believed to be on the rise. In contrast to the SLI Pernambucano, its weakness with respect to IP assets vis-à-vis other states with the same level of maturity in their Local Systems, such as Minas Gerais, Rio Grande do Sul and Santa Catarina, was demonstrated, demonstrating the vulnerability in the regarding the concept and practice of Intellectual Property. Regarding the average number of patent deposit concessions in the main Brazilian states, the average is around 7.84%. In the state of Pernambuco, this index drops to 3.25%, which shows that there is a lack of significant density in comparison to the other states and their number of patents deposited. Regarding the progress of patent concessions required in the state, the city of Recife has the largest number of applications filed. It is believed that this phenomenon occurs because of the proximity to the various existing R&D institutions in the locality. However, the low relevance of the deposit-concession ratio for an ecosystem that is considered one of the most developed in the country and which has one of the largest and awarded Technology Parks in Brazil by FINEP is indisputable. With regard to higher education institutions, Federal Institutions account for more than 88% of requests, noting that there is a very large deficit vis-à-vis other Pernambuco research institutions. It starts from the premise that there is a lack of information and / or awareness on the part of R&D institutions, capable of taking the state to higher levels in relation to public policies on Intellectual Property and its assets.

Regarding the filing of patents by legal entities, there are a significant number of large Pernambucano companies as the largest depositors, however the percentage is much lower than the institutions that promote R&D, evidencing a mismatch between academia-company, capable of making the process time consuming in what it concerns the increase in knowledge of the Local Innovation System in Pernambuco in relation to IP assets. It is worth taking into account that the largest number of companies, holding patents, are only 4 (four), leading to the consideration that Intellectual Property assets linked to IP policies should be more widespread and developed throughout the state and, in particular, in companies called Startups, so evident in SLI Pernambucano.

In view of the development of this manuscript on updated figures on Intellectual Property assets for a rising Local Innovation System, it is clear that there is a disorder in the importance of IP for the leap of the state towards technological and innovative development, which should solidify once and for all the Local

Innovation System of Pernambuco, being able to project the SLI Pernambucano to levels never seen before. It is assumed that there is a gap in the item Intellectual Property assets, which is already considered a strong Ecosystem in Northeast Brazil. It is considered that, in seeking other methodological and matrix ways to boost knowledge about IP assets, the state should take a leap towards geographic innovation, starting from the knowledge and realization of intellectual assets properties, capable of taking the referred ecosystem to assertive levels and international dissemination.

V. References

- [1] _____. INPI Statistical Yearbook of Industrial Property. Available at <http://antigo.inpi.gov.br/sobre/estatisticas/anuario-estatistico-de-propriedade-industrial-2000-2012-cont2> Accessed on August 30, 2020.
- [2] _____. National Institute of Industrial Property (INPI), 2009 Management Report. Rio de Janeiro: inpi / MDIC, 2009. Available at: www.inpi.gov.br. Accessed on September 4, 2020.
- [3] _____. National Institute of Industrial Property (INPI), 2015. Rio de Janeiro. Available at www.inpi.gov.br. Accessed on August 30, 2020.
- [4] ANDERSEN, J. B. What are innovation ecosystems and how to build and use them. Available at: <http://www.innovationmanagement.se/2014/06/20> Accessed on 21 mar. 2016
- [5] Bulletin of Indicators in Science and Technology and Innovation: Patenting Activities in Brazil and in the State of Pernambuco, Recife, August 2015.
- [6] CASSIOLATO, J. E.; LASTRES, H. M. M. Innovation and development systems: the policy implications. São Paulo in Perspective, São Paulo, Vol. 19, n. 1, p. 34-45, sea. 2005.
- [7] CONDEPE FIDEM (Pernambuco State Planning and Research Agency). Municipal. Available at: <http://www.condepefidem.pe.gov.br/web/condepefidem/municipal> Acesso m 02 jan. 2020.
- [8] Innovation Ecosystems: Conceptual Alignment [electronic resource] / Clarissa Stefani Teixeira; Dorzeli Salete Trzeciak; Gregório Varvakis Orgs. - Florianópolis: Perse, 2017, e-book.
- [9] HUDSON, J; MINEA, A. Innovation. Intellectual Property Rights, and Economic Development: A unified Empirical Investigation. World Development, Vol. 46 pp.66-78, 2013;
- [10] Mapping the Innovation Ecosystem in Pernambuco, ECOSSISTEMA.PE by Desenvolve.ai, 2020. Available at: www.desenvolve.ai Accessed on August 30, 2020.
- [11] NELSON, R. R.; WINTER, S. G. An evolutionary theory of economic change. Campinas: Editora da Unicamp, 2005.
- [12] PORTO DIGITAL. History of Porto Digital in: What is Porto Digital. 2017. Available at <https://www.portodigital.org/parque/historia> Accessed on 30 Dec. 2019
- [13] QUEIROZ, R. Chinese technological advances Transform the country into the power of Innovation, s / d. Available at: <https://chinavistos.com.br/avancos-tecnologicos-chineses/> Accessed on 09/30/2019
- [14] RUSSO, S.L Intellectual Property, Technologies and Society, São Cristóvão: Editora UFS, 2016.
- [15] SANTOS, D.; Alex Gazarro from SCHMIIDT, Vitor Klein & ZEN, Aurora Carneiro. The emergence of an entrepreneurship ecosystem: the case of Armazém da Criatividade and the city of Caruaru, Pernambuco, Brazil. 26th Anprotec Conference, 2016.

- [16] SANTOS, A .M DOS et al. Tools for extracting and analyzing information on patent bases: an application for the five-fold helix model. Proceedings of the III Singep, II S2IS, p.16, Nov, 2014.
- [17] Schumpeter, Joseph Alois (1997), Theory of Economic Development, an investigation into profit, capital, credit, interest and the Economic Cycle. Editora Nova Cultural, São Paulo.
- [18] WORLD INTELLECTUAL PROPERTY ORGANIZATION. Available at <http://www3.wipo.int/portal/en//>. Accessed on December 31, 2016.