

Innovation in Manufacturing Industries and The Use of Industrial Property in Brazil

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Abstract

Innovation is a key issue for business and in the current scenario of even more fierce competition, industries need to accelerate more and more the introduction of innovative knowledge and practices in order to stay in the market. In view of this environment, it is imperative that the Brazilian manufacturing industries improve their innovative processes, and it is also necessary to strengthen the use of industrial property. This study aims to know the context of innovation in the Brazilian manufacturing industries and the use of industrial property in Brazil. In the initial part, a theoretical research (discussion by theory) was carried out and then the descriptive and exploratory methodology was used, using a set of information and data collected from research and studies provided by institutions of national and international relevance . Based on the study, it was possible to draw a detailed profile of the innovative environment of the Brazilian manufacturing industries, whose main challenge is the high costs of innovation and the most important impact is the maintenance of the companies' participation in the market. It was also verified the low use of industrial property by the business segment.

Keywords: Innovation; Manufacturing Industries; Industrial Property

1. Introduction

Innovation has a strategic role for business competitiveness, even more so in a scenario like the current highly fierce competition. Despite this, the theme does not have the necessary protagonism in Brazilian development policies. This finding can be seen through the environment that is not very stimulating to innovation, where the establishment of institutions, connections and instruments is very slow vis-à-vis the accelerated process existing in other countries (CNI, 2018; CORNELL, INSEAD AND WIPO, 2017)

In Brazil, historically, innovation and technology have been treated as a consequence of economic growth, instead of being treated as inducing economic and social development. In view of this scenario, it is urgent to break this logic, through the creation of a set of strategic actions that make the environment more conducive to the emergence and strengthening of innovative initiatives that enable the economic transformation of the country, towards a model that sustains development over time. (CNI, 2018; UNIVERSIDADE CORNELL, INSEAD E WIPO, 2017).

In addition to a more stimulating external context, the internal environment of companies must also enable innovation to occur successfully. The way in which the most important factors of any company

(employees, financial resources, structure, among others) are directed, is that it will allow the creation of an internal climate favorable to the desired innovative results (FARIA and SOFIA, 2012).

In companies that seek to make a more structured management of innovation, Industrial Property deserves mention, as it is an efficient way to protect investments made for the development of new products, services and production processes (IEL, 2010).

In view of this scenario, in which companies have more than one desire, but a real need to innovate, this study has as its general objective to know the innovative environment existing within the Brazilian transformation industries and the existing relations with the external environment, also raising indicators on the use of industrial property in Brazil, making it possible to identify important actions to accelerate the business innovation process in the country.

To achieve the objectives of this study, the methodology used in the initial part was theoretical research (discussion by theory), where the main concepts related to innovation were presented, possible ways to implement an innovation management model and more relevant concepts about ownership intellectual property and industrial property.

Then, a descriptive and exploratory analysis was made, using a set of information and data collected from research and studies made available by institutions of national and international relevance. The Innovation Survey (PINTEC, 2014) for the 2012-2014 three-year period, carried out by the Brazilian Institute of Geography and Statistics - IBGE, which was used because it is the most recent national research, most recent on the subject, and for have a great level of details, allowing the characterization of the innovative environment of the Brazilian transformation industries. Still in the analysis of the results, relevant indicators on the use of industrial property in Brazil were presented, made available in the reports and databases of the National Institute of Industrial Property - INPI. Finally, the main results were discussed and the final considerations were presented.

2. Innovation in the Business Context

For Schumpeter (1982), innovation is different from the simple economic adaptation that happens naturally and originates from discontinuous changes, being characterized as a change that occurs internally and not through external pressures. According to the author, a creative destruction occurs that allows the generation of new combinations of the productive factors, enabling the increase of productivity.

To survive in Schumpeterian environments, organizations must be able to cope with the increasing complexity and changes that occur with great speed. In these contexts, companies with the capacity to innovate will be able to respond to challenges more quickly and explore new products and market opportunities, better than non-innovative companies. Innovation helps the company to deal with the turbulence of the external environment and is a strong driver of growth and organizational development, therefore being one of the main drivers of long-term success in business, particularly in dynamic markets (Jiménez-Jiménez & Sanz -Valle, 2011; Bonazzi & Zilber, 2014).

To understand how innovation is approached within the business reality, it is worth highlighting one of the most widespread concepts globally, among companies and institutions that encourage the expansion

of innovative actions, which is the one given by the Organization for Economic Cooperation and Development (OECD), in the Oslo Manual, translated into Portuguese and made available by the Financier of Studies and Projects (FINEP):

A implementação de um produto (bem ou serviço) novo ou significativamente melhorado, ou um novo processo, ou um novo método de marketing, ou um novo método organizacional nas práticas de negócios, na organização do local de trabalho ou nas relações externas (OCDE, 2005, p. 55).

Often, the implementation of one of these types of innovation can be accompanied by other types, triggered by the need to adapt other areas of the business to the main change (Mattos, Stoffel & Teixeira, 2010).

Innovation can be classified as radical or incremental. The radical is due to the structural rupture in the current pattern, which may cause the emergence of new sectors, markets and economic activities. Incremental innovation improves the existing standard and does not generate structurally significant changes. Despite this, it can be considered that these two forms of classification are actually part of a larger context, where they are complementary during the cycle of the innovative process (Dosi, 1988; Aleixo & Tenera, 2009; Souto, 2015).

It is worth highlighting the relevant difference between innovation and invention. If there is no “Result”, that is, if it does not generate a market impact, the invention will not be considered an innovation, but, on the other hand, there may be innovation without the need for the invention, which may occur by simply reconfiguring the use of resources (human, technological, etc.). In many cases, the invention does not reach the market, as it has no real use and in other cases it takes many years to become economically viable and finally become an innovation. Thus, innovation is directly related to market success. Mattos, Stoffel and Teixeira (2010) propose the following theoretical model to define innovation (Figure 01):

INNOVATION = IDEA + IMPLEMENTATION OF ACTIONS + MARKET RESULTS

FIGURE 01 - Theoretical model of innovation.

Source: Adapted from Mattos, Stoffel and Teixeira, 2010

It is important to note that innovation is not limited to high-tech sectors. It is a global event that affects all segments, as well as companies of all sizes, and can play a highly relevant role in overcoming the challenges of economic development. Based on the definition of the OECD (2005), it appears that it is possible for any company to find ways to innovate, and it should be seen as fundamental for sustaining the market, as it allows for the expansion of competitiveness (Cornell University, Insead & WIPO, 2017; Vargas et al, 2016).

Although innovation can occur in many ways, technological competition deserves to be highlighted, which challenges organizations to develop new technologies, being an important way for companies to obtain sustainable competitive advantage. The new technological knowledge enables new products to enter the market and new processes to be applied to the enterprise (Yang et al, 2015; Ramos, Figueiredo

& Pereira-Guizzo, 2018).

Undoubtedly, innovation is the factor that most allows companies to remain competitive in the current competitive scenario where, more than a simple need for survival, it makes it possible to plan for the future, through the ability to reinvent and generate leadership opportunities in the segment medium in the medium and long term (Mello et al., 2013).

In view of this reality, in order to be able to improve the desired innovative results for the country, continuous efforts are needed to stimulate the improvement of environments aimed at generating innovations (Cornell University, Insead & WIPO, 2017).

2.1 Innovation Management

In order for innovative efforts to effectively generate results, it is essential to understand which processes and factors guide the most correct business decisions regarding innovation, generating greater efficiency in the use of resources and capacities during the execution of business strategies (Kenski & Marcondes, 2017).

According to Rita et al. (2010), companies that adopt structured processes of accumulation of learning, to direct their actions in innovation, reduce uncertainties and have greater potential for success over time.

There are many studies on ways to innovate successfully, and there have been changes over the past few decades on best practices for achieving good results. Despite this, innovative companies did not automatically follow the models prescribed as dominant in their time, verifying that, often, success is based on how to manage the innovation process in its specific context (Ortt & Duin, 2008).

Understanding the various paths of innovation management (and their respective advantages and disadvantages) is a prerequisite for selecting the best model for each reality. It is important to know the context and the mechanisms that determine the decision-making process, as what is usually verified is that companies develop a path in which their management practices adapt to their business, being called contextualized innovation. In view of this, there is a need to create not a single model, but a range of paths, which offers companies several possibilities to manage their innovation process (Ortt & Duin, 2008).

One way that companies can follow to start the innovative process is through the generation of a significant number of high quality ideas, in order to obtain a balanced portfolio of innovative projects with potential for success. However, it is necessary to select and prioritize ideas and concepts that are strictly promising, due to the scarcity of resources, which does not allow to develop at the same time all the good ideas that may arise in this process (Kock, 2015).

Companies need practical management of the portfolio of ideas to simultaneously support the variety and selection of ideas and concepts before entering the portfolio of innovation projects. The management of the portfolio of ideas can be guided by three elements: ideation strategy, formalization process and stimulating creativity. The three elements independently and significantly contribute to success (Kock, 2015).

For the innovation management process to be effective over time, it becomes extremely important to implement structured forms of monitoring and evaluation, such as through the creation of indicators that show whether the results achieved are being satisfactory, thus the need for identify which variables

should be measured and with which tools. Monitoring the innovation management process, with the appropriate metrics, will allow greater security in decision-making, especially those involving financial investments (Vargas, 2016).

To support the execution of innovation management, software can be counted on, which supports the union of concepts with ideas, in a creative balance that guarantees the organization's internal operations. To this end, a methodology for managing the process of generating ideas, together with software, as a support tool, can provide an adequate infrastructure for innovation (Flynn, 2003).

From the structuring and through the incorporation of scientific research, planning, problem solving and knowledge construction, it is possible to generate a favorable space for decision making and the development of innovation (Silva et al, 2014).

For all this innovative environment to work more efficiently, one of the critical points is the qualification of the people involved, being necessary to have qualified employees in their respective areas, especially the managers. It is then necessary to qualify employees and, in particular, managers, which is a critical factor for planning and executing innovation processes (Faria, 2012).

The efficiency of the management of all processes that involve innovation will strongly influence the speed with which the company will be able to implement innovations, marking the competitive capacity and defining the winners (Almeida, Silva & Oliveira, 2014).

One way to facilitate the implementation of innovations is based on the open innovation model. This way of innovating, which is based on the search for external knowledge as a basis for innovation, can create competitive advantage, representing a development alternative for companies, helping them to compete in the current business environment (Silva & Dacorso, 2013).

For Esteves and Nohara (2011), the creation, sharing of knowledge and acquisition of information, through the combination of resources and capacities, are strategies that increase the probability of success of organizations, corroborating the growing trend in the formation of strategic alliances.

For this whole innovative process to happen in the companies Maçaneiro and Cherobim (2011), they highlight the importance of financing technological innovation. Conditioning factors, incentives and obstacles to access to government resources, for financing, can be decisive in the innovative process.

3. Innovation and Industrial Property

Within the context of innovation management, especially technological, a relevant theme is intellectual property, as it allows greater security in the appropriation of the economic results of innovations that have the potential to be protected according to the specific legislation of intellectual assets. Within the scope of intellectual property, within a company, come all activities related to Research and Development (R&D), such as, for example, product development, knowledge management, technology transfer, etc. (Runge, 2015).

Despite the importance of these themes, Intellectual Property is poorly understood in the business environment, and its use should be strengthened, which is much less than its potential. The World Intellectual Property Organization defines that intellectual property is related to the creations of the mind: inventions, literary and artistic works, as well as symbols, names and images used in commerce (WIPO,

2018),

According to Mendes and Borher (2012), for many decades the area of law had a great dominance in the subject of intellectual property, due to the knowledge accumulated by groups of lawyers specialized in the subject, who learned all the details necessary to defend the legal interests of companies with IP assets. Within the current economic context, intellectual property has gained a much larger space, and it is therefore necessary to attract actors from different areas of law. Areas such as science, technology, business, management, economics, among others, give the theme a multidisciplinary character (Mendes & Borher, 2012).

With the entry into force of the innovation laws in several countries, boosting in particular the interaction between knowledge centers and private and public companies, there is a great importance of the practical management of IP, so that companies can benefit from the records in the agencies competent and able to follow the ways of protecting IP assets (IEL, 2010).

According to Brazilian law, Intellectual Property can be divided into the following categories: Copyright; Sui Generes Industrial Property and Protection. From a business perspective, Industrial Property deserves special mention, as it is the branch that aims to ensure legal protection of industrial inventions; utility models; industrial designs; brands (be they product, service, certification or collective); industrial secrets and geographical indications (INPI, 2018).

INPI is the federal government institution responsible for industrial property and other fields of intellectual property of interest to the industry. This body is responsible for any and all procedures for requesting, granting and negotiating industrial property in the national territory (INPI, 2018).

Within the industrial property there are the following branches, with their respective objectives, as shown in Table 1:

Table 1 - Branches of Industrial Property and their main characteristics

Branches		objective
PATENT	Invention Patent	Technological progress
	Utility Model	Technical-functional improvement
Industrial draw		Ornamental improvement (appearance of the object)
mark		Companies and / or products
Geographical Indications		Indication of Origin and Designation of Origin

Fonte: Adapted from INPI, 2018.

As shown in the previous table, the innovations that enable technological advancement must be protected and generally this type of industrial property is the one that has the greatest possibility of generating more significant economic results. However, in order to encourage this type of innovation to occur more frequently, a favorable innovative environment is needed, therefore it is important to understand the main characteristics of the Brazilian manufacturing industries, as it is the main segment responsible for manufacturing the products that will reach consumers.

4. Innovation in the transformation industries and the use of Industrial Property in Brazil

In view of the objective of the study, an exploratory research of a descriptive nature was chosen, which sought to survey the behavior of the phenomena and obtain information based on studies and data from institutions of national and international relevance, on the theme of innovation in the transformation and the use of industrial property in Brazil.

4.1 Innovation in the Brazilian segment of the transformation industries

In 2018 Brazil occupied the 64th position (Table 01), among 127 countries, in the Global Innovation Index (GII), which measures the innovative performance of nations since 2007, being in a lower position than that occupied by several countries that have economies much more modest. This indicator shows the country's need to accelerate its investments in R&D.

TABLE 01 - Classifications in the Global Innovation Index - GII 2017 - 10 best classifieds and Brazil

Country / Economy	Score (0-100)	Rating
Switzerland	68,40	1
Netherlands	63,32	2
Sweden	63,08	3
United Kingdom	60,13	4
Singapore	59,83	5
USA	59,81	6
Finland	59,63	7
Denmark	58,39	8
Germany	58,03	9
Ireland	57,19	10
Brazil	33,44	64

Source: Adapted from Universidade Cornell, Insead e WIPO, 2018.

Given this scenario, it is important to understand the innovative reality in Brazil. PINTEC 2014 evaluated 132,529 Brazilian companies, of which 115,268 were from the manufacturing industry segment, representing approximately 87% of the total.

From this IBGE study, it appears that 36.3% of the manufacturing industries are innovative in products and / or processes, 34.1% innovate only in the organizational and / or marketing part, while 26.7% did not take any action innovative between 2012 and 2014, as shown in Figure 02.

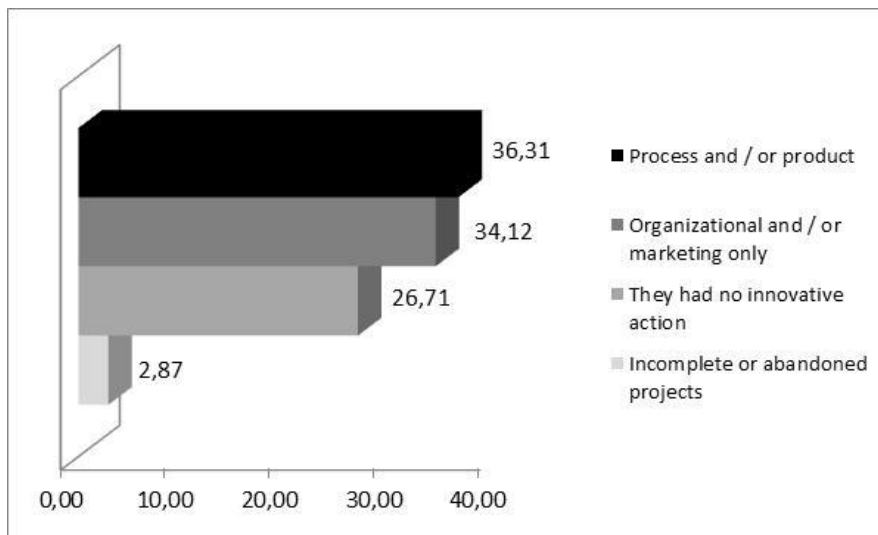


FIGURE 02 - Distribution of Manufacturing industries by type of innovation (Brazil - 2012-2014) (%).

Source: Adapted from IBGE - PINTEC / 2014.

Figure 03 shows the distribution, in percentage, of the number of innovative manufacturing industries, according to the type of innovation introduced. There is a predominance of those that innovated only in process (17.9%), followed by innovators both in product and in process (14.5%), with both types as a reference to novelty mainly for the national market.

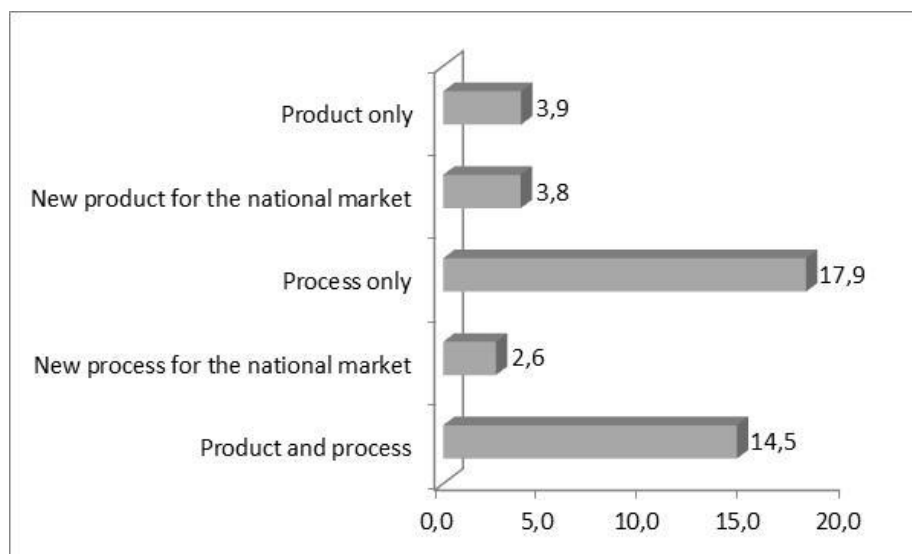


FIGURE 03 - Rate of manufacturing industries that implemented product or process innovations, by type and according to the market benchmark - (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

The most important innovative action was the acquisition of machinery and equipment, being considered as of high or medium importance by 73.6% of the industries. Next came Training (61.7%) and Software Acquisition (31.7%). See Figure 04.

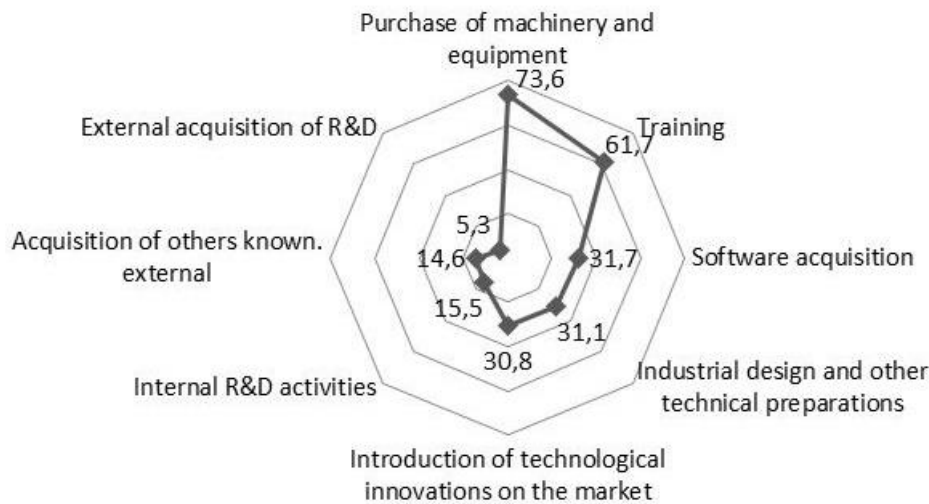


FIGURE 04 - Innovative actions developed, according to the percentage of manufacturing industries that indicated a degree of medium or high importance (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

When analyzing the rate of expenditures made in innovation activities in relation to net sales revenue, it is noticed that the total investment is 2.16% and 0.68% when it comes specifically to internal R&D activities. The acquisition of machines and equipment stands out as the most significant expense among those made with innovations, being 0.86% (Figure 05).

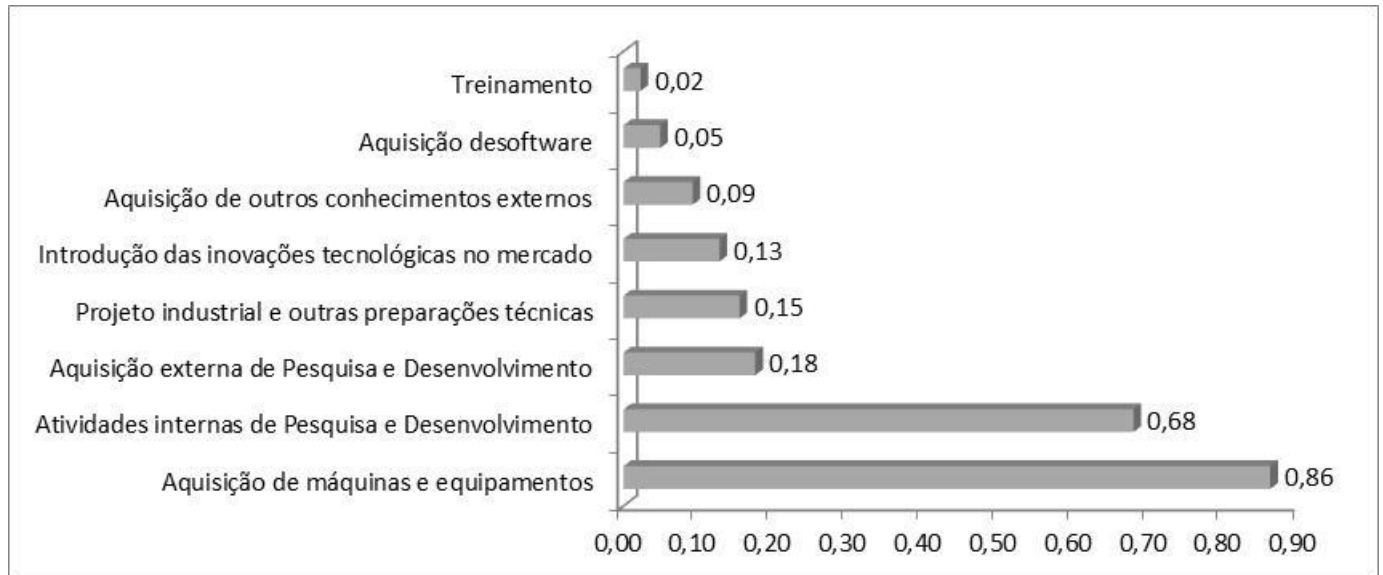


FIGURE 05 - Percentage of net sales revenue spent on innovative activities in the manufacturing industries (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

When analyzing Figure 06, it can be seen that 72.5% of the companies that implemented product or process innovation carry out continuous R&D activities, which corresponds to 96.9% of the expenditures, while 27.5% of the companies do so. occasionally, representing 3.1% of expenditures.

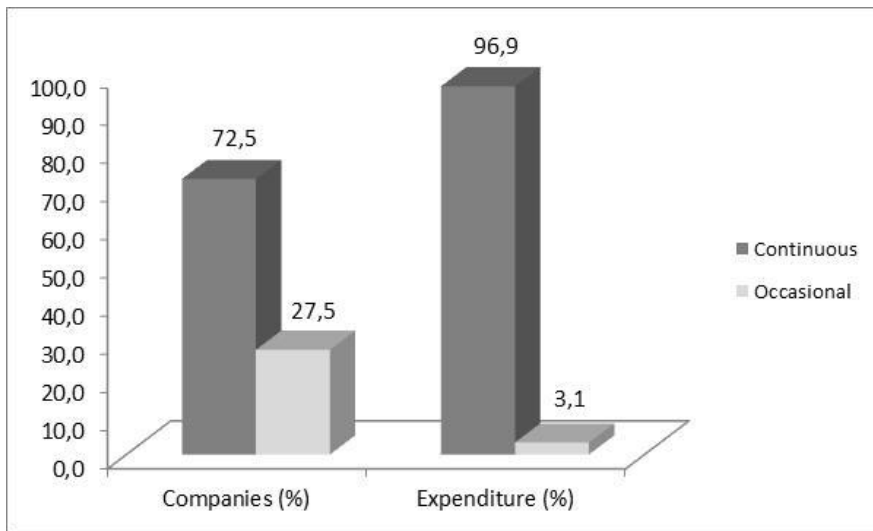


FIGURE 06 - Distribution of the manufacturing industries that implemented product or process innovations, that did R&D and the expenditures made with an indication of the nature of this activity (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

In industries that have Research and Development (R&D) areas, among the people employed in these areas, it can be seen that 60.8% are dedicated exclusively to innovative activities, while 39.2% have partial dedication, dividing their time with other activities (Figure 07).

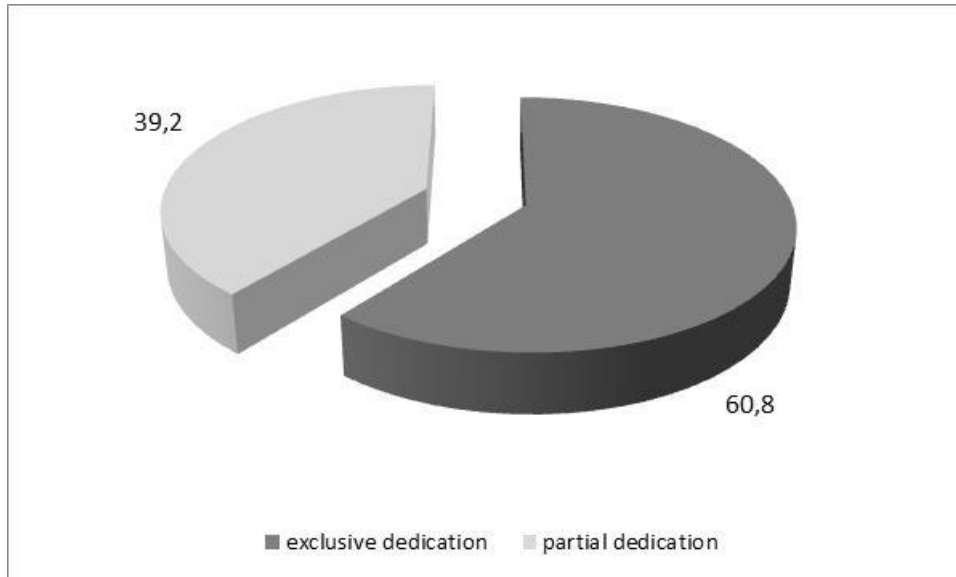


FIGURE 07 - Participation of employed persons, by type of dedication, in the R&D activities of the manufacturing industries, Brazil - 2014 (%).

Source: Adapted from IBGE - PINTEC / 2014.

Among people engaged exclusively in internal R&D activities, most are researchers (66.1%), followed by technicians (25.5%) and finally assistants (8.4%). See Figure 08.

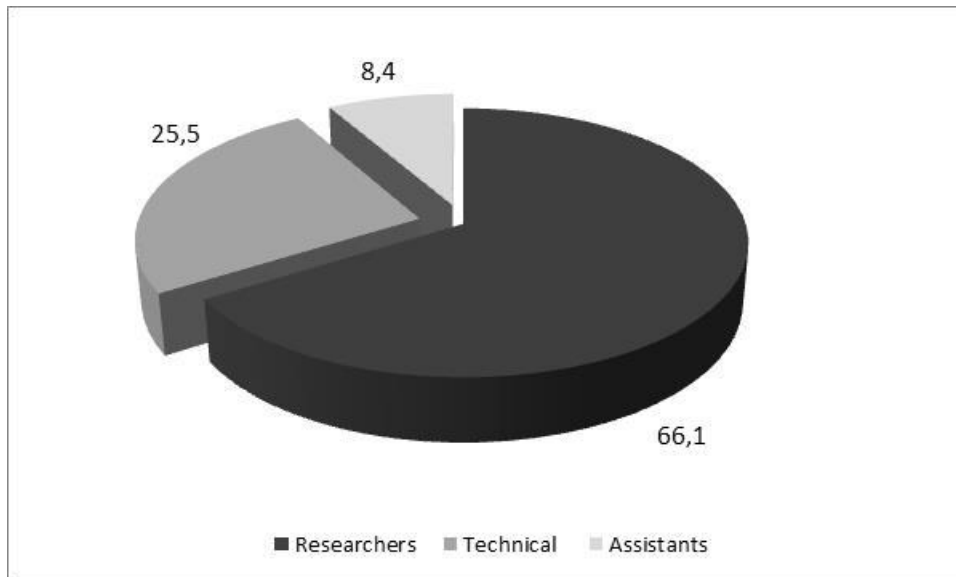


FIGURE 08 - People employed in internal Research and Development activities, with total dedication equivalence, of the manufacturing industries that implemented innovations, by occupation (%) - (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

The alternative identified as the most important source of information is the Computerized Information Networks, having high or medium importance for 78.8% of the industries. Next came Customers and consumers (73.3%) and Suppliers (70.5%). See Figure 09.

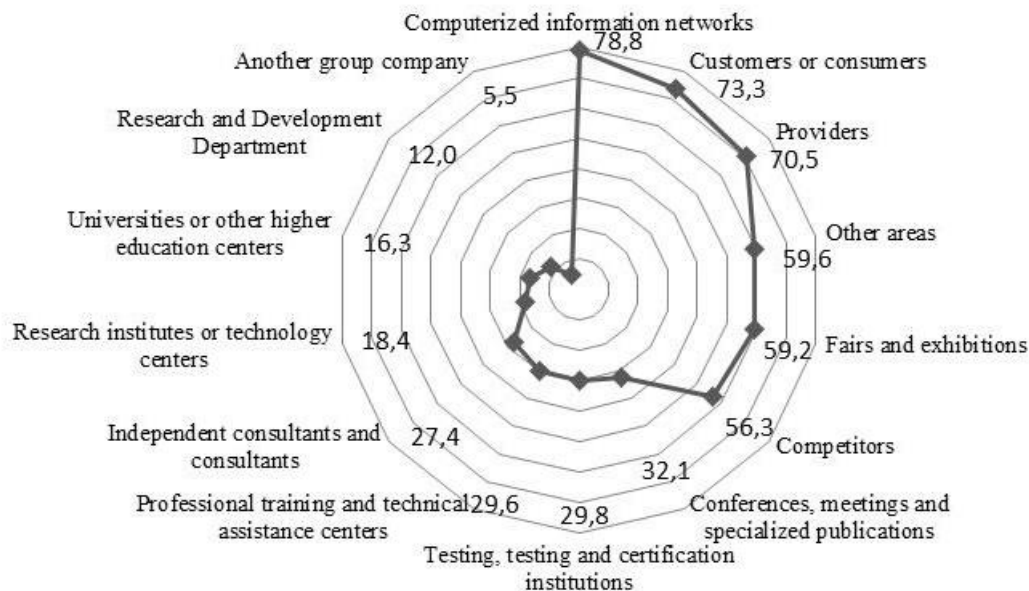


FIGURE 09 - Information sources for innovation, according to the percentage of manufacturing industries that implemented product or process innovations and that indicated a medium or high degree of importance (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

When analyzing the most important cooperation partnerships, Suppliers, Clients and consumers stood out,

and far more distant, testing, testing and certification institutions, with 76.1%, 70.5% and 33.9%, respectively, of industries pointing to high or medium importance (Figure 10).

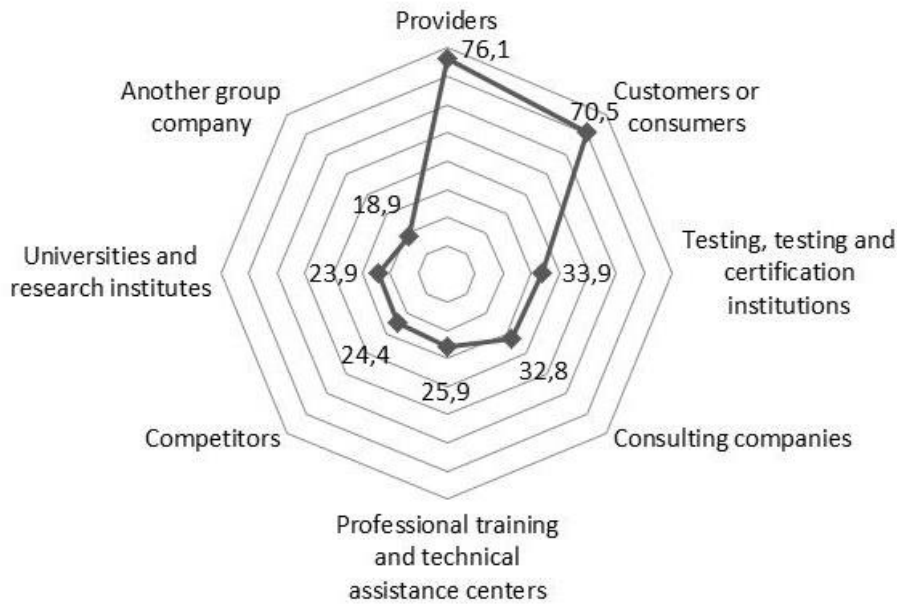


FIGURE 10 - Cooperation partners, according to the percentage of manufacturing industries that implemented product or process innovations and that indicated a medium or high degree of importance (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

The industries that implemented process or product innovations evaluated that the major impacts caused by this innovative behavior were: Maintenance of the company's market share (81.3%), Improvement of product quality (80.6%) and Increase of productive capacity (73.6%), having received high or medium importance (Figure 11).

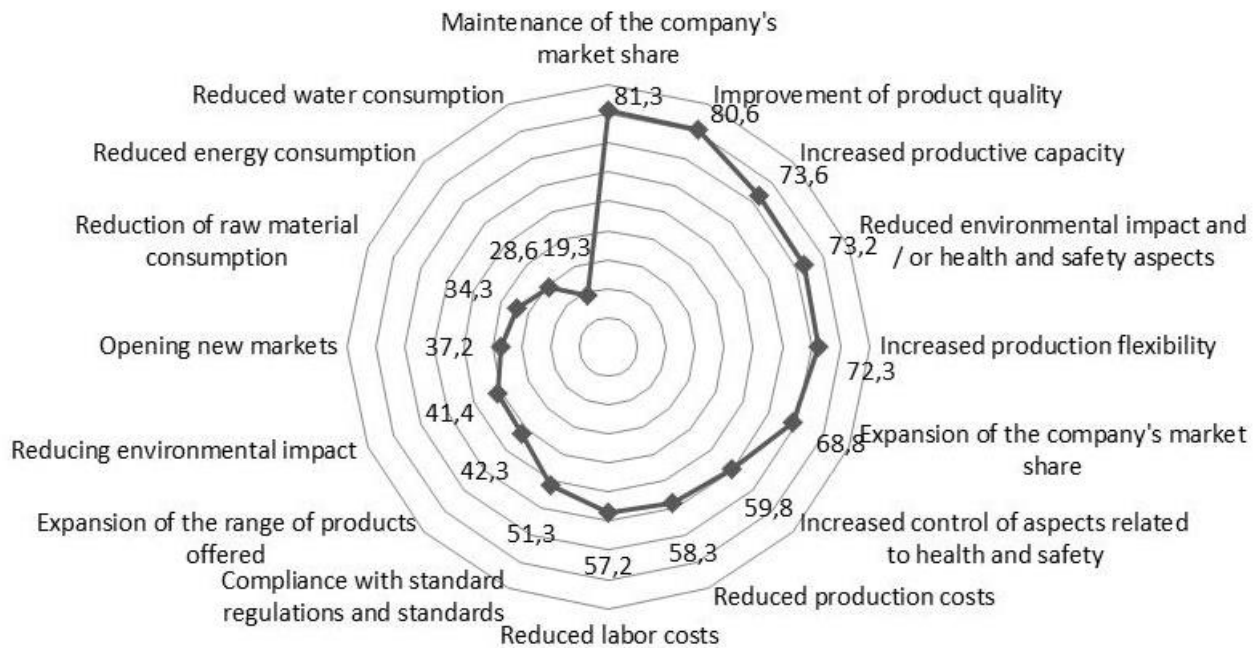


FIGURE 11 - Impacts of innovations, according to the percentage of manufacturing industries that

implemented product or process innovations and that indicated a degree of medium or high importance (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

Of the industries that implemented innovation, 31.2% used some government program to finance machinery and equipment to innovate and 7.7% used Other support programs (Figure 12).

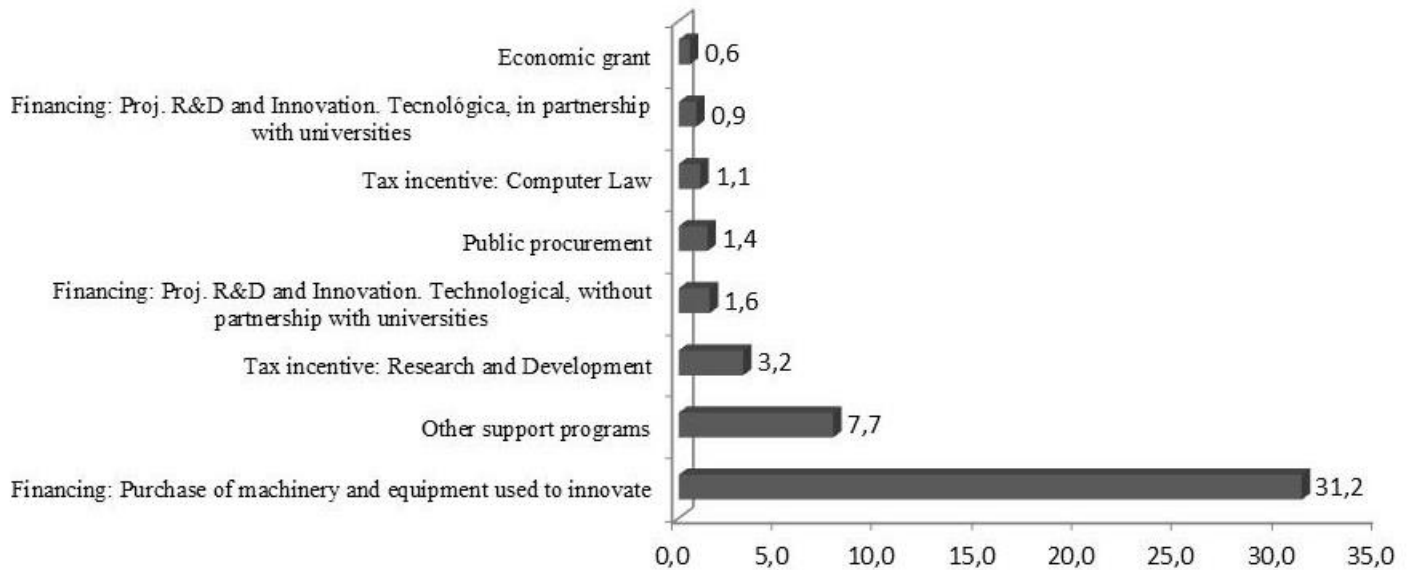


FIGURE 12 - Percentage of innovative manufacturing industries that used government programs, by type of support (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

Among the industries that implemented product or process innovations, the main problems and obstacles to innovate were pointed out: the high costs of innovation (82.3%), the excessive economic risks (75.3%) and the scarcity of appropriate sources of financing (64.0%). See Figure 13.

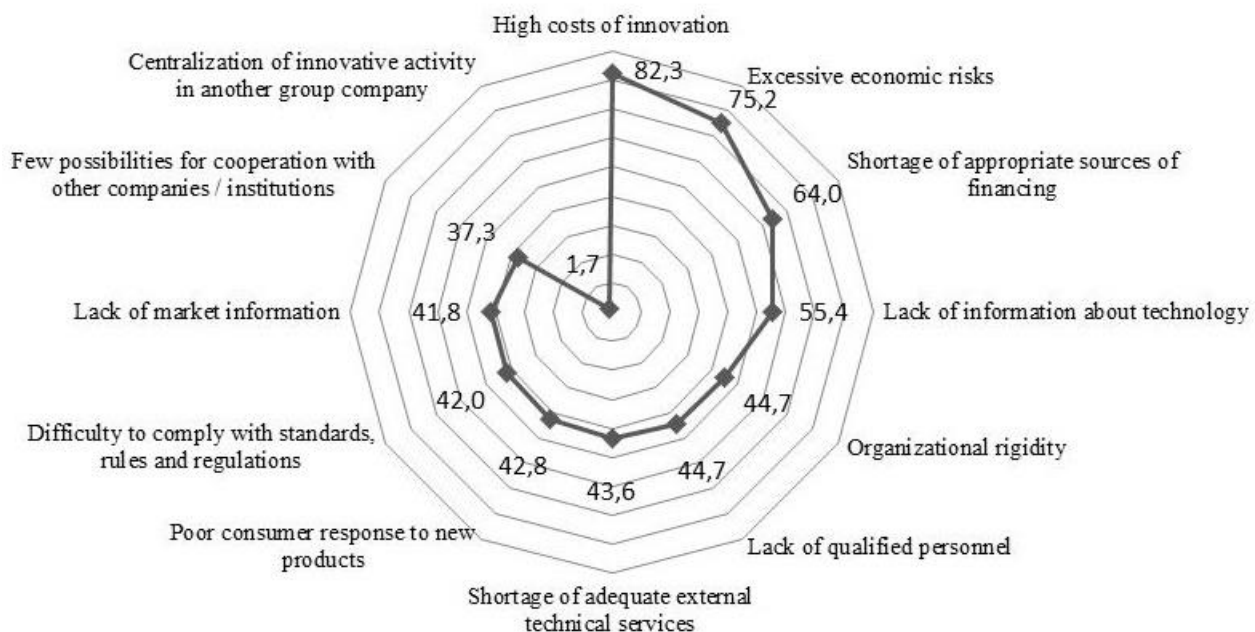


FIGURE 13 - Problems and obstacles to innovate, according to the percentage of manufacturing industries that implemented product or process innovations and that indicated medium or high importance (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

When asked about the reasons for not innovating, Brazilian transformation industries pointed out as the most important cause, with 56.3%, market conditions (Figure 14).

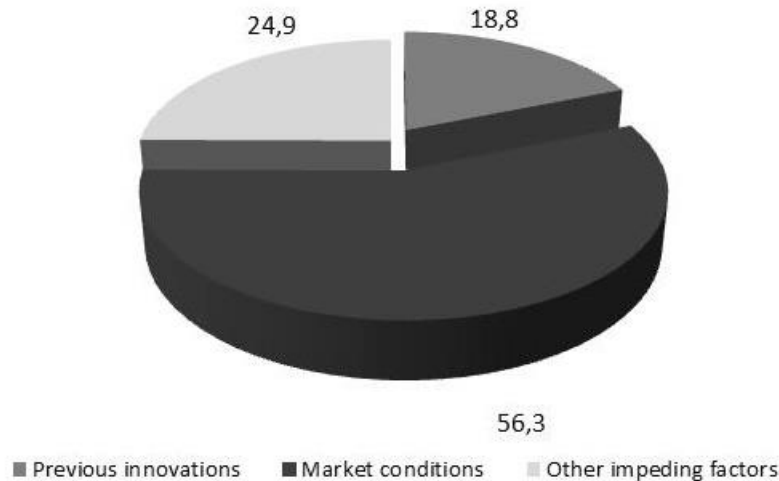


FIGURE 14 - Reasons given by the manufacturing industries for not innovating (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

In the industries that implemented product or process innovation and that also carried out organizational and marketing innovations, the main innovations in these areas, as can be seen in Figure 15, were Management techniques (60.7%), Work organization (57, 1%) and Aesthetics, design or other changes (50.2%).

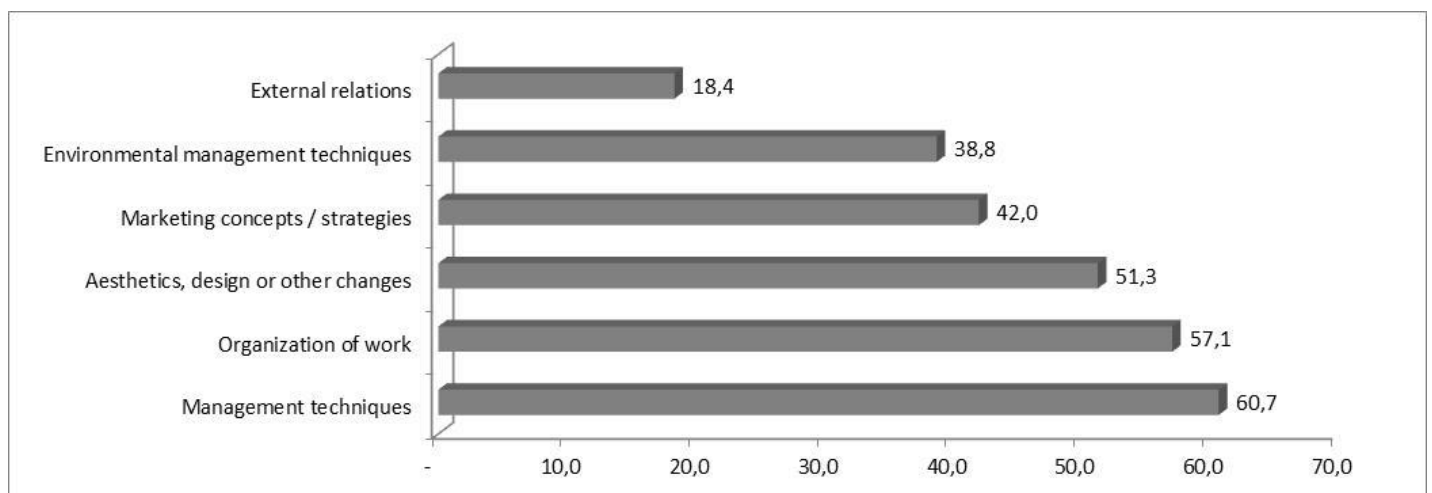


FIGURE 15 - Rate of manufacturing industries that implemented product or process innovations, and that carried out organizational and marketing innovations, by type of innovation (Brazil - 2012-2014).

Source: Adapted from IBGE - PINTEC / 2014.

Figure 16 shows that among the industries that did not implement product or process innovation, but that carried out organizational and marketing innovations, the main innovations in this area were also Management techniques (28.3%), Work organization (28.0 %) and Aesthetics, design or other changes (23.0%).

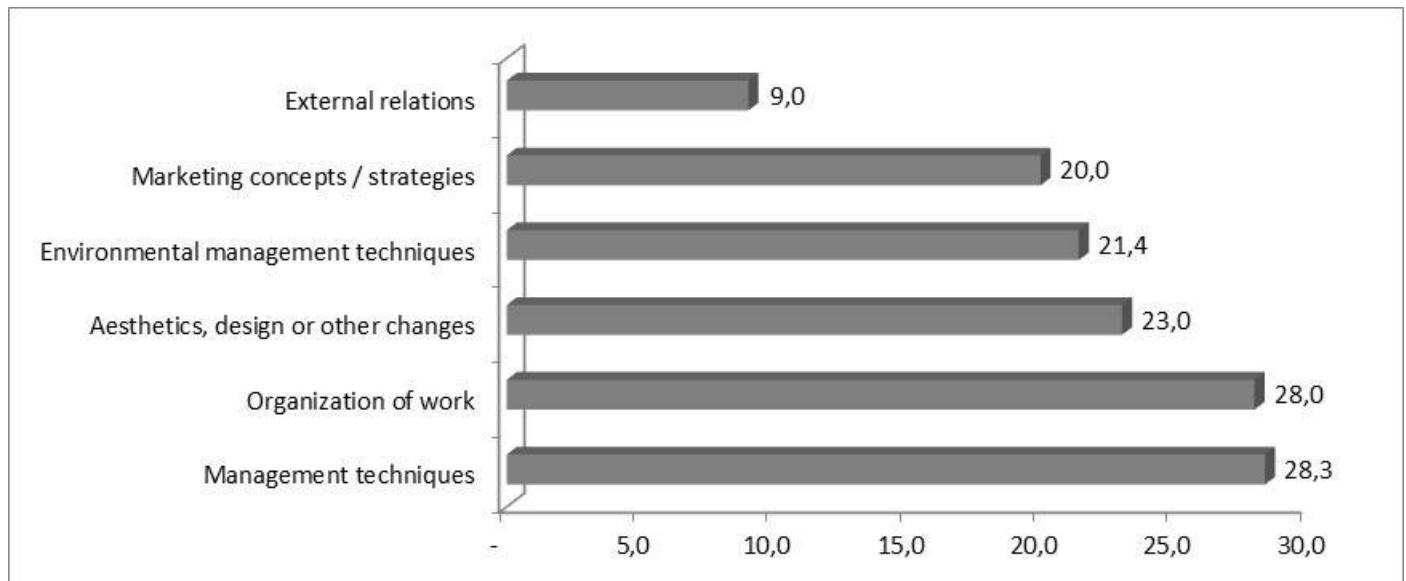


FIGURE 16 - Rate of non-innovative manufacturing industries in products or processes and without projects, which carried out organizational and marketing innovations - Brazil - 2012-2014.

Source: Adapted from IBGE - PINTEC / 2014.

To provide intellectual protection for innovations, in addition to legal protections (patent, utility model, etc.) it is also possible to use other types, considered more strategic depending on the type of innovation. When analyzing the responses on the use of these other types of protection (Figure 17), it was found that the most common is the Industrial Secret (11.1%), followed by the Leadership Time over competitors (6.5%) and Design Complexity (5.7%).

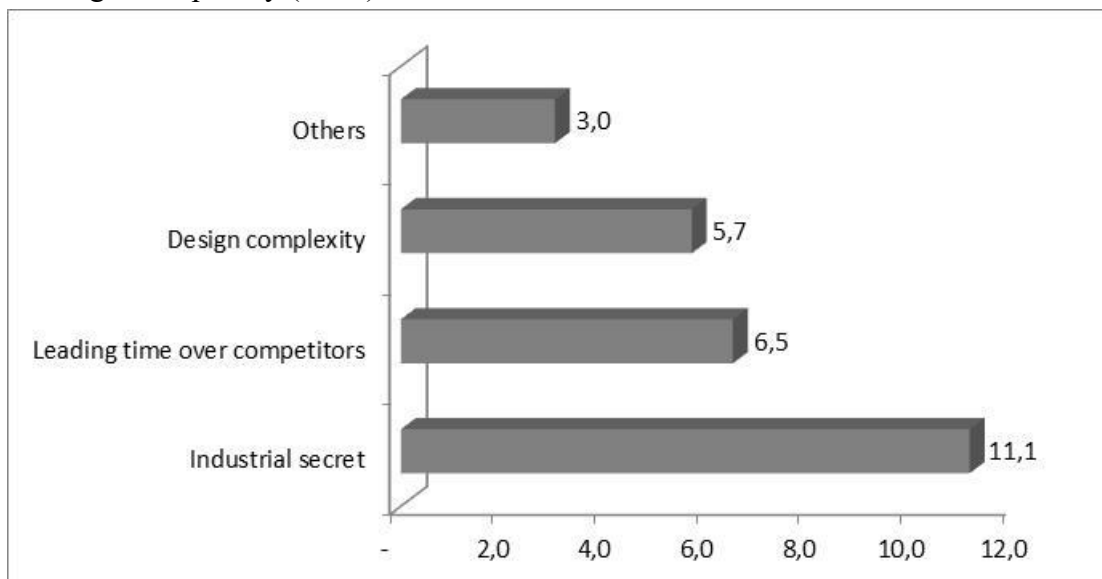


FIGURE 17 - Rate of manufacturing industries that used strategic, non-formal methods of protection in the total of those that implemented innovations - Brazil - 2012-2014 period.

Source: Adapted from IBGE - PINTEC / 2014.

4.2 The use of Industrial Property in Brazil

When analyzing the Brazilian innovative environment, as seen in the previous item, it appears that the industries still need to advance a lot, but the effort needs to be even greater when observing the data on the use of Industrial Property in Brazil.

The National Institute of Industrial Property (INPI) publishes on its website several data (in its area of statistical data and in its studies, bulletins and other publications), presenting information that allows to know in more detail the reality of the use of Industrial Property in Brazil.

According to the data made available by the INPI, in the year 2017, 25,658 Invention Patents (IP) were filed in the country, of which 5,480 came from residents of Brazil. 2,843 Utility Models and 81 Addition Certificates were also deposited by residents.

When analyzing the profile of resident depositors, of Patent of Invention, it appears that almost half (47%) are individuals, followed by educational and research institutions and government (23.9%). Only 26.7% of this type of deposit comes from companies, as can be seen in Figure 18.

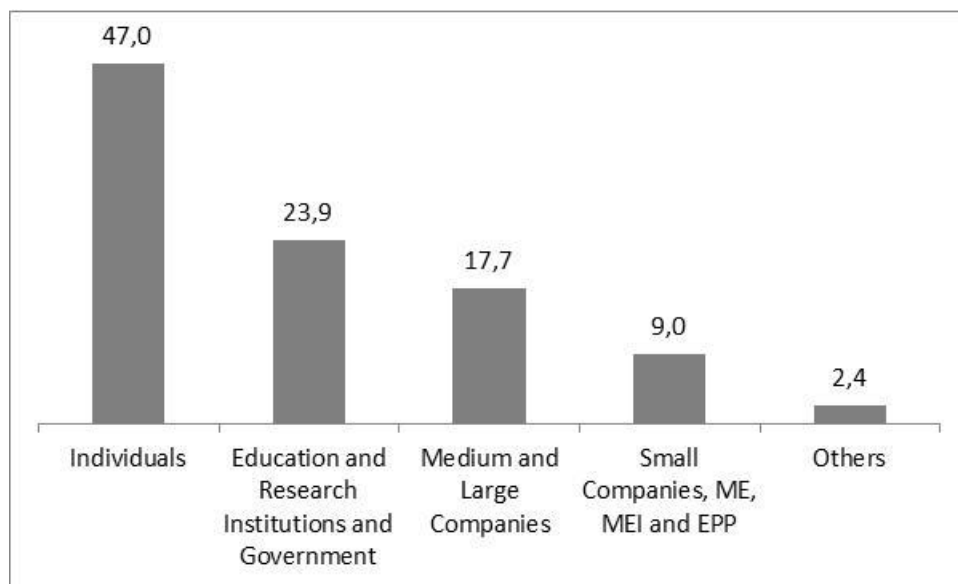


FIGURE 18 - Profile of Resident Depositors - Invention Patent - BR, 2017 (%).

Source: Adapted from INPI, 2018.

When analyzing Figure 19, it can be seen that between 2012 and 2017 there was a reduction in both the total deposit of Invention Patents (PI) and the Utility Model (MU), being 15.7%, in the first case, and 3.1% in the second.

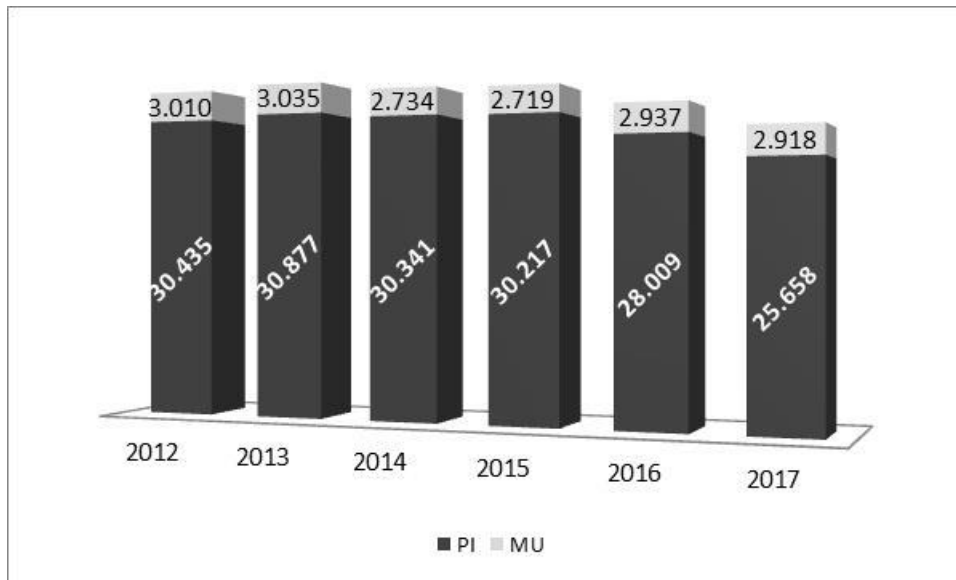


FIGURE 19 - Total deposit by type - BR 2012 to 2017.

Source: Adapted from INPI, 2018.

Differently from what happened with the total, Figure 20 shows that the deposits of Invention Patents made by residents grew more than 14%, between 2012 and 2017. It is also worth mentioning the significant participation of residents regarding the Utility Model (MU), which in 2017 represented over 97% of the total deposits of this type in Brazil.

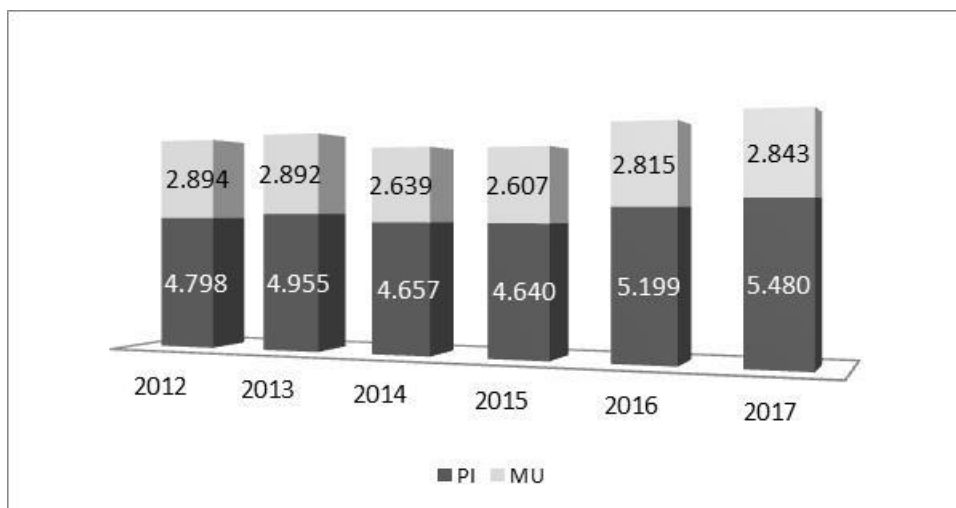


FIGURE 20 - Deposit of residents by type - BR 2012 to 2017.

Source: Adapted from INPI, 2018.

When analyzing the legal nature of patent depositors, Figure 21 reveals that there was an increase in the participation of the legal entity, both in invention patents and in utility models. Despite this growth, there is still a great disparity between the number of industries in the country (more than 364 thousand in 2017) and the amount of deposits made by companies.

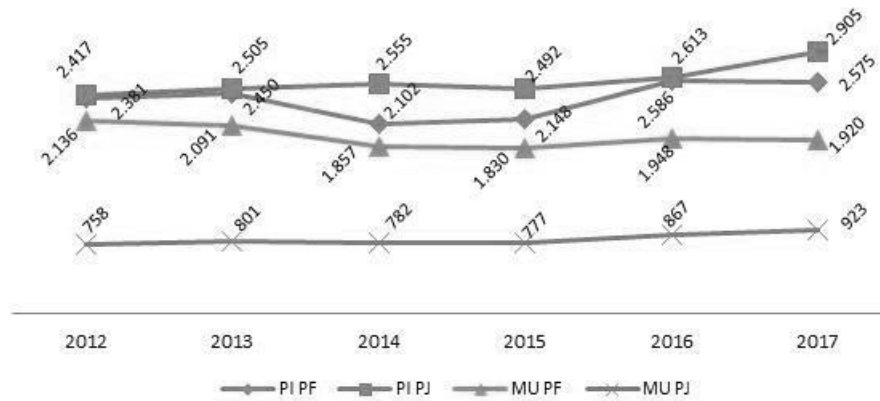


FIGURE 21 - Patent Deposits by Type and Legal Nature of the 1st Depositor, BR - 2012 to 2017.

Source: Adapted from INPI, 2018.

5. Final Discussions and Considerations

Innovation contributes decisively to the development of a society. In view of this finding, countries need to stimulate the innovative process of both Science and Technology Institutions (ICTs) and companies, which ultimately bridge the gap between the technologies produced and society.

Between the idea, behind an innovation, and its transformation into a product or service (new or improved), made available to consumers, there are several steps that will achieve much more efficient results if they are managed in a more structured way.

As all these steps have financial and economic costs involved, the possibility arises of seeking legal protection, through Industrial Property, to avoid the unfair entry of competitors who could simply misappropriate all the research and development already carried out, without need to make the investments already paid for by the innovative company.

Throughout the study, it was found that Brazil occupies the 64th position in the ranking of the countries that make up the Global Innovation Index (GII), being a very timid position, when taking into account the world importance of the Brazilian economy, which throughout in recent years it is among the 10 largest in the world.

To better understand the issues that generate this result, especially in terms of innovative business performance, this study analyzed the internal environment of Brazilian manufacturing industries, which represent more than 87% of the national industrial park, as well as their main innovative interactions with the external environment.

The industrial segment has great relevance in the generation of innovation, especially in technology. Despite this, in Brazil only approximately 36% of companies in this segment developed some innovative product or process action, between 2012 and 2014.

It is worth mentioning that the innovative action pointed out as the most relevant refers only to the updating of the industrial park (acquisition of machinery and equipment, acquisition of software and training of employees), being the first item also the most relevant from the point of view of financial investments. , relegating investments in R&D to the second place, in financial terms, and to the sixth place in relation to the importance attributed by the companies.

Despite the low percentage of companies that innovate in products and processes, a positive fact is that more than 72% of them carry out continuous R&D activities. It is also worth mentioning the fact that almost 61% of the people dedicated to this type of activity do so exclusively, being mostly researchers or technicians.

Research institutes or technological centers and universities or other higher education centers are considered as a source of information of high or medium importance for only 18.4% and 16.3%, respectively, of the manufacturing industries. This ends up being reflected in a small percentage of industries that consider the existence of cooperation partnerships with these institutions to be important. This fact reinforces the need to strengthen actions to bring together knowledge institutions and the business sector.

Relevant information, and that innovative companies recognize, is the importance of innovation for maintaining market share, which is followed by improving the quality of products and increasing productive capacity, based on innovative actions.

The costs of innovation are often significant and that is why governments in the most innovative countries develop robust programs for innovative stimulus. In Brazil less than 48% of the manufacturing industries used government programs to innovate and even so the vast majority used only to finance machinery and equipment, with very low use of government programs for R&D. This fact ends up being reflected in the main problems or obstacles pointed out, to innovate, which are the high costs of innovation, the excessive economic risks and the scarcity of appropriate sources of financing.

The low degree of innovation, mainly from investments in R&D, can be pointed out as one of the causes of the low use, by companies, of Intellectual Property, especially Industrial Property, which is an efficient way to protect part of the investments made for the development of new products, services or processes.

In Brazil, almost half of patent applications are made by individuals, while companies account for well below one third of the total. Even with a growth in the number of depositing companies, the representation is still small, when compared, in particular, with the number of transformation industries existing in Brazil.

Despite the short time, to generate practical effects in the context of strengthening the innovative environment, "Decree nº 9.283, of February 7, 2018" deserves mention, which established measures to encourage innovation and scientific and technological research in the productive environment, stimulating the acceleration of the development of the national and regional productive system.

All the questions analyzed during the study show that there is still a long way to go to strengthen the innovative environment of Brazilian industries. More robust actions, mainly focused on stimulating and financing R&D, may lead to an increase in the deposit of patents and the use of other intellectual protection instruments for new products, services and processes, contributing more significantly to accelerate the growth of participation of Brazil in the international innovation scenario.

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