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# THE IMPORTANCE OF THE TECHNOLOGICAL INNOVATION CENTER FOR THE DEVELOPMENT OF INNOVATION IN HIGHER EDUCATION IN BRAZIL

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## ABSTRACT

This article aims to describe the importance of a technological innovation center for higher education in Brazil. Since 2021, with the innovation law and later, the legal framework has strengthened actions to promote innovation and higher education institutions have been able to include in their planning and programs that delegate policies to the Institute of Science and Technology (ICT'S) and consequently include in their institutions the creation of a Technological Innovation Center in order to expand partnerships and foster resources and execute innovative projects. The data collection of the article is based on the review of the regulatory standards, practices and policies that are applied in the country's higher education institutions. Seek results and analyze the development and main challenges of innovation managers and team. In the end, analyze the evaluation and performance mechanisms and impacts of the innovation policy and provide the latest standardizations that compete with the technological innovation centers and include the adhesion of institutions in the creation of the Institutes of Science and Technology (ICT), actions that encourage the institutions to become effective and in favor of innovation in education and technological courses and partnerships with commercial companies, industry, start-up, incubators and innovation agencies throughout the national territory.

**Keywords:** Intellectual Property, Higher Education, Center for Technological Innovation, Brazil.

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## INTRODUCTION

In Brazil, the Innovation Law is Law No. 10,973/2004, known as the "Innovation Law". It was created to encourage scientific research and technological development in companies, stimulating interaction between research institutions, companies and the public sector.

The legislation aims to strengthen innovation and competitiveness in the country. The 2016 Legal Framework for Innovation refers to the set of laws and regulations that aim to promote and regulate innovative activities in various sectors. These laws usually cover issues such as intellectual property, tax incentives, research and development funding, public-private partnerships, and others.

It is worth noting that laws related to innovation can vary significantly from country to country. Below, I highlight some common aspects found in the legal frameworks of innovation:

**Intellectual Property:** Intellectual property refers to creations of the mind, such as inventions, literary and artistic works, designs, symbols, names, and images used in commerce. It is protected by laws, which grant creators or holders exclusive rights to use their creations for a certain period. They cover: Copyrights, Patents, Trademarks, industrial designs and trade secrets.

Intellectual property aims to encourage innovation and creativity by providing creators and inventors with a reward for their work. Intellectual property laws vary from country to country, but many international organizations, such as the World Intellectual Property Organization (WIPO), seek to standardize and harmonize these laws globally.

In Brazil, we have the Ministry of Science and Technology responsible for standardization and public policies and we have the INPI – National Institute of Intellectual Property, which operates in services, programs, projects and consultations with legislation and promotes the performance of agencies, partners and are sources for registration, consultation and monitoring of what is produced and intermediates what permeates the rights of creations and performance in the market. Compliance with rules and technological support for members and academic activity.

## METHODOLOGY

The article is based on a bibliographic survey and search for data in scientific research sources and the process of identifying, locating, analyzing and organizing relevant

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sources of information and allows obtaining a comprehensive view of what has already been published on the subject in question. Articles, books and research with quality and relevance to the area of study were identified. The study is based on concepts inherent to all innovation ecosystems, legislation and legal framework and is based on the higher level in Brazil.

## OBJECTIVE

- Contextualize the concept and applicability of the Center for Technological Innovation.

SPECIFIC OBJECTIVES

- Conceptualize NIT'S and Higher Education;
- Describe the regulatory standards for the period from 2004 to 2024;
- Show the best practices applied.

## CONTEXTUALIZATION OF THE OBJECT

The NIT"S are structures established by one or more Scientific, Technological and Innovation Institutions (ICTs), with or without their own legal personality, whose purpose is the management of institutional innovation policy and specific competencies provided for in Law No. 13,243, of January 11, 2016.

In order to generate innovation and entrepreneurship policies, assisting in the promotion, use of knowledge and the use of new technologies from universities and research institutes. These structures are linked to higher education, where they act, delegate programs and promote services and act as an environment for innovation.

Higher Education in Brazil is divided into three levels: colleges, university centers and universities.

**College:** offer undergraduate and graduate courses that operate in certain areas of knowledge, in general, technological.

**University Centers:** similar to universities, but as a structure for the creation of new courses and with an emphasis on the creation of linked units and applied practices.

**Universities:** availability offer undergraduate, graduate and master's and doctoral programs, includes several areas of knowledge.

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Structure of Higher Education in Brazil adopts academic credit systems, facilitating student mobility and transfer between courses and national and international exchanges. Graduation lasts an average of four years, licensure is for professional teaching training or higher education, aimed at teachers. The technological courses are of short duration, with an average of two years. The postgraduate course comprises the specialization programs (lato sensu), master's (Stricto sensu) and doctorate.

The higher education system in Brazil is periodically funded by the Ministry of Education (MEC), the federal government maintains scholarship and financing programs, such as PROUNI – University for All Program, FIES – Student Financing Fund, access for low-income students. Universities in Brazil have the autonomy to define their curricula and internal policies, ensuring a diversity of educational approaches.

Many universities seek international partnerships, exchange programs to promote the internationalization of higher education in the country. NIT acts as an intermediary between research institutions (such as universities and research institutes) and the business sector, facilitating the transfer of knowledge and technology developed in academic institutions to the market. NITS play a key role in protecting intellectual property resulting from academic research. They assist in the identification, registration, and management of patents, trademarks, and other intellectual assets. By supporting the creation of startups and spin-off companies based on technologies developed in academia, NITs contribute to the development of the entrepreneurial and innovative ecosystem. The Innovation Centers promote strategic partnerships between academic institutions and companies, encouraging collaboration in research and development projects. Through the search for funding for research and innovation projects, NITs help to secure resources for the continuity and expansion of innovative activities in research institutions. By connecting academic research with the practical needs of the business sector, NITs promote applied research, oriented towards practical solutions and market application. The performance of NITs can contribute to regional economic development, boosting innovation and the creation of qualified jobs. By promoting events, courses, and activities related to innovation, NITs help create a culture of innovation in academic institutions and companies, stimulating the search for creative and technologically advanced solutions.

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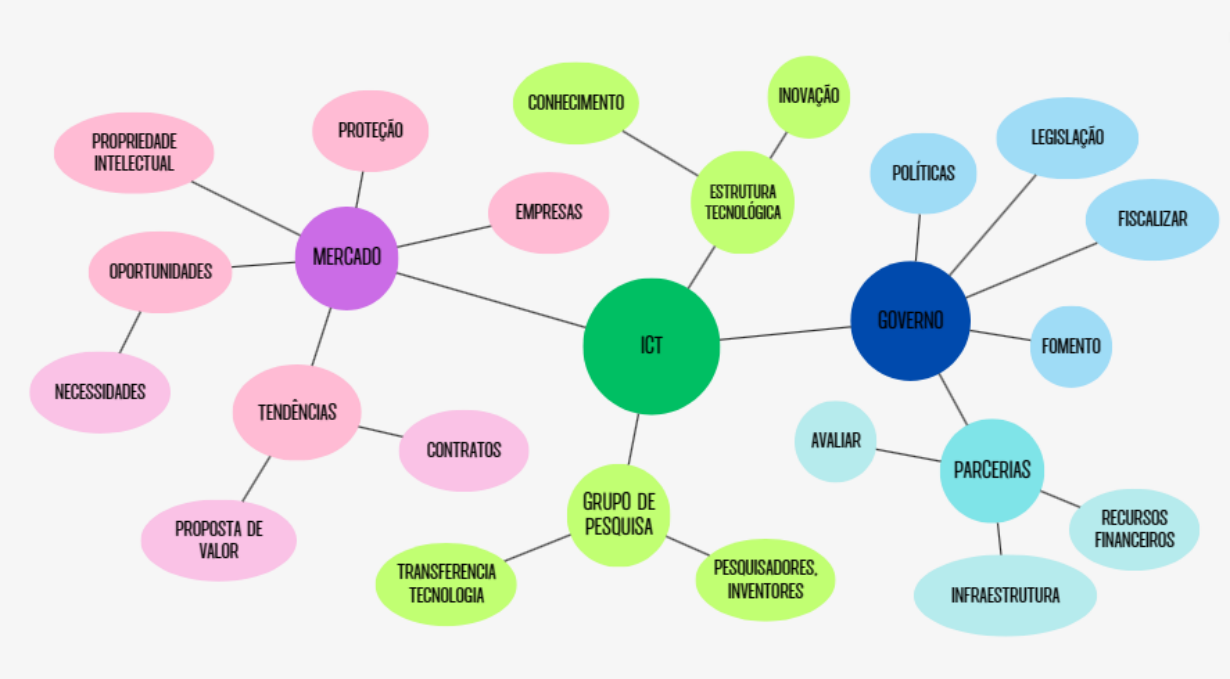
**Figure 1 – Triple Helix and dimension**




Source: The authors (2024).

## TECHNOLOGICAL INNOVATION CENTER

The Technological Innovation Centers (NIT) are structures present in higher education institutions with the objective of promoting innovation and technology transfer between academia and the productive sector.

**ICT:** body or entity of the direct or indirect public administration or non-profit private legal entity legally constituted under Brazilian laws, with headquarters and jurisdiction in the country, which includes in its institutional mission or in its social or statutory objective basic or applied research of a scientific or technological nature or the development of new products, services or processes.

**Technological Innovation Center:** structure established by one or more ICT'S with or without legal personality whose purpose is the management of institutional innovation policy and minimum competencies the attributions.

**Support foundation:** Law 8.958, of December 20, 1994 and see decree n.9841, of 2019 - created with the purpose of supporting research, teaching and extension projects, institutional, scientific, technological development projects and projects to stimulate innovation of interest to ICTs, registered and accredited with the Ministry of Education and the Ministry of Science, Technology and Innovation

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**Public researcher:** Law 13.243, 2016 - occupant of an effective public position, civilian or military, or holder of a public function or job that performs, as a functional attribution, research, development and innovation activity.

**Independent inventor:** an individual, not occupying a permanent position, military position or public employment, who is an inventor, breeder or author of creation.

**Technology park:** planned complex for business and technological development, promoting the culture of innovation, industrial competitiveness, business training and the promotion of synergies in scientific research, technological development and innovation activities, between companies and one or more ICTs, with or without a link between them.

**Technological Pole:** industrial and technological environment characterized by the dominant presence of micro, small and medium-sized companies with correlated areas of activity in a given geographic space, with operational links with ICT, human resources, laboratories and organized equipment and with a predisposition to exchange between the entities involved for consolidation, **marketing** and commercialization of new technologies.

**Technological Extension:** activity that helps in the development, improvement and dissemination of technological solutions and in making them available to society and the market.

**Technological Bonus:** subsidy to micro and small and medium-sized companies, based on budget allocations from public administration bodies and entities, intended to pay for the sharing and use of technological research and development infrastructure, the contracting of specialized technological services, or the transfer of technology, when this is merely complementary to those services, under the terms of the regulation.

**Intellectual Capital:** knowledge accumulated by the organization's personnel, which can be applied in research, development and innovation projects.

**Stimulating research and development (R&D):** NITs often play a crucial role in stimulating applied research and technological development within the institution. They facilitate collaboration between researchers, professors, and students, creating an environment conducive to the generation of innovative knowledge.

**Technology Transfer:** they act as intermediaries between academia and the productive sector, facilitating the transfer of technology and knowledge generated in universities to companies and organizations. This can result in the practical application of scientific discoveries, driving innovation across industries.

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Promotion of entrepreneurship: programs and initiatives aimed at entrepreneurship. They support students, researchers, and professors in transforming innovative ideas into startups and entrepreneurial projects, promoting entrepreneurial culture in the academic environment.

**Intellectual Property Protection:** protection of intellectual property generated in higher education institutions. This involves registering patents, trademarks, and other copyrights to ensure that discoveries and innovations are adequately protected and, if desired, commercialized.

**University-Business Collaboration:** Partnerships between academia and the business sector, NITs promote mutually beneficial collaboration. Companies can benefit from the university's scientific and technological expertise, while researchers and students can gain access to real-world problems and practical opportunities.

They play a crucial role in promoting innovation, technology transfer, and strengthening relations between academia and industry, thus contributing to socioeconomic and technological development.

## UNIVERSITY AND BUSINESS

Technological innovation centers perform several essential functions in the academic and business context. Its main functions:

**Management of portfolios of projects with registered intellectual property:** they are responsible for managing the intellectual property generated within the institution, such as patents, software registrations, trademarks, among others. This involves identifying, protecting, and properly marketing these assets.

**Contract management, mediator and technology transfer:** Facilitating the transfer of technology between academia and the productive sector is a central function of NITs. They act as intermediaries to connect researchers, professors, and students to companies interested in applying or developing innovative technologies.

**Technology Licensing:** negotiate licensing agreements with companies that wish to use or develop technologies originated in the institution. This allows discoveries and innovations to be applied commercially, generating revenue for the institution and encouraging innovation.

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**Fundraising:** They seek sources of funding for research and innovation projects, whether through government notices, partnerships with companies or research promotion programs.

**Legal Support:** managing intellectual property, NITs also offer technical and legal support to ensure adequate protection of intellectual assets, including the registration of patents and other copyrights.

Promotion of a culture of innovation: raise awareness and engage researchers, professors and students in the importance of innovation and technology transfer.

## INNOVATION POLICY IMPLEMENTED IN NITS

Innovation policy refers to the guidelines, strategies, and measures adopted by governments, organizations, and institutions to promote and encourage innovation in various sectors. Innovation is key to driving economic, social, and technological progress, as well as increasing global competitiveness.

**Financing and Tax Incentives:** with a structured core, it is possible through projects and partnerships, provision and subsidies for research and development (R&D), with the granting of tax incentives to companies that invest in innovative activities.

**Confidentiality:** Depending on the technology developed, it requires including if the party requests it. Confidentiality also has commercial power, profit. No problem, it needs to be very clear and included in the contract, both for technology transfer and for project execution.

**Partnership agreement:** in this context public, private and government partnerships. The contracts provide for ownership of intellectual property and results. Encouragement of partnerships and research centers to promote the sharing of knowledge and resources.

**Teaching Activity:** include projects on topics related to innovation, promoting the training of qualified professionals in the areas of science, technology, engineering and mathematics (STEM) to boost innovation in different sectors. Creation of favorable environments for the emergence of startups, with incubators and accelerators, in addition to simplifying bureaucratic processes for new ventures

**Intellectual Property Protection:** Developing laws and regulations that encourage the creation and protection of intellectual property, such as patents, trademarks, and copyrights.

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**Technological Infrastructure:** Investment in data and information technology, communication networks and other technologies essential for innovation.

Applied research: Promotion of research that has practical applications and direct impact on the solution of problems or the development of new products and services.

**Social Sustainability:** Research, new products and innovative practices that promote sustainable development and the resolution of social challenges.

**Evaluation of results and performance:** implementation of a control mechanism and evaluation of the impact of innovation policies, adapting project stages accordingly and ensuring effectiveness.

Figure 2 – Legal framework for innovation in Brazil


Source: The authors (2024).

## R&D – RESEARCH AND DEVELOPMENT

Law No. 11,196/2005 and Decree No. 5,798/2006, bases of the Good Law. Briefly, they were instituted to stimulate private investments in research and technological development, both in the design of new products, as in the manufacturing process, and in the addition of new functionalities or characteristics to the product or process. It is essential that such actions imply incremental improvements and effective gains in quality and/or productivity for the company, resulting in greater competitiveness in the market.

RD&I activities do not necessarily have to be related to the company's core activity, it is sufficient that they are classified as:

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**Applied research:** which are the works performed with the objective of acquiring new knowledge, with a view to the development or improvement of products, processes and systems;

**Directed basic research:** which are the works carried out with the objective of acquiring knowledge about the understanding of new phenomena, also with a view to the development of innovative products, processes or systems;

**Experimental development:** which are the systematic works outlined from pre-existing knowledge, aiming at proving or demonstrating the technical or functional feasibility of new products, processes, systems and services, or even an evident improvement of those already produced or established.

## APPLIED R&D PRACTICES

**Advise the Management and administrative support** in decisions on the provision of services compatible with the objectives of Law No. 10,973/2004, in activities aimed at innovation and scientific and technological research in the productive environment;

**Implement, improve and ensure the maintenance of the institutional policy to encourage the protection of creations,** licensing, innovation and other forms of technology transfer;

**Confidentiality of information**;

**Promote the protection** of the creations developed in the institution;

**Dissemination of creations**, subject to intellectual protection;

**Negotiate technological partnership contracts** and technology transfer and licensing contracts for the granting of the right to use or exploit creation;

**Negotiate** contracts for the provision of technological services;

**Evaluate and expedite contracts** and partnership agreements for joint research activities, as well as define, on a case-by-case basis, the participation in the results of co-ownership of intellectual property arising from these contracts, after hearing the other interested parties;

**Assess and issue an opinion** on requests for assignment of rights over creation;

**Monitor** the application of resources arising from the implementation of Law No. 10,973/04, pursuant to article 19 of Decree No. 5,563/05;

**Monitor the processing of applications** and the maintenance of the institution's intellectual property titles;

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**To act in the identification**, protection and dissemination of research results and technologies that can be commercially exploited.

**Promote and participate in technical meetings** and training in the area of intellectual property and technology transfer, as well as maintain cooperative contacts with NITs of other institutions.

## DISCUSSION OF RESULTS

It is noted that since the innovation law and the legal framework for innovation and the innovation policy, universities have had the opportunity and legal support to expand the capacity of actions and programs that did not only serve undergraduate, graduate and university extension. Academics from the master's and doctoral programs and researchers can have triple helix as support to foster science and technology, with companies in partnerships to provide innovative services and new products to the market, optimize industrial production, protect creations and profit as a consequence. There are several concepts that guide NIT'S, which is most permeated is the ability to act in a society that tries to keep up with new technologies and improve education for its population.

## FINAL CONSIDERATIONS

I conclude that the technological innovation center in universities is vitally important to support the actions of ICTs and the academic community. For universities to be able to serve the market and foster innovation and regional development, they need to foster culture, have infrastructure, financial resources, qualified research in specialized programs and legal support, they need to mobilize. The NIT has a mediating role, to encourage that everything is promoted and made available to society and companies to have a continuous flow of activities, meet the expectations of companies and angels, protection of their owners, researchers. Higher Education in Brazil has evolved, but primarily public universities, generating an environment of innovation, with incubators, extension projects and projects of master's and doctoral programs. It is noted that there are great differences in the elaboration of laws for innovation, currently we have the legal framework for innovation and the national innovation policy, only the legal framework for start-ups. The INPI is the institute that most promotes protection in the country, trains and is responsible for industrial protection processes and covers several areas of knowledge, being in the promotion of agriculture, knowledge, commerce and information technology. R&D resources

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are used by ICT to generate knowledge, courses, training, provide opportunities for universities to have infrastructure, buy equipment, have a more vulnerable society, inclusion and effectively develop science and technology in the country.

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