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INNOVATION: A LEVER FOR NATIONAL DEVELOPMENT

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ABSTRACT

Science, Technology, and Innovation (ST&I) play a crucial role in contemporary society, characterized by their dynamic and multifaceted nature. In this context, the objective of this research is to highlight how Innovation can contribute, within the scope of ST&I, to National Development. The study starts from the hypothesis that Innovation, when integrated into public and strategic policies, is capable of generating far-reaching economic, social, and political impacts. The proposal aims to emphasize Innovation as a catalyst for progress, beginning with a review of the fundamental concepts of ST&I and an analysis of the relevant legislative history. It then explores the relationship between Innovation and Development, underscoring the importance of policies that foster an environment conducive to creativity and technological advancement. The research adopts the hypothetical-deductive method, with bibliographic and documentary analysis. It concludes that the institutional and regulatory strengthening of Innovation is a necessary condition for consolidating an autonomous and sustainable development strategy for Brazil.

Keywords: Disruptive Innovation; Legal Framework; National Strategy.

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INTRODUCTION

Technology has brought a frenetic pace of transformation to the modern world, which is now immersed in a vast and diverse range of technological innovations. This rapid change has accelerated innovation processes and intensified competition across all sectors, generating expectations for improved social well-being and seemingly limitless opportunities.

However, it has also increased competition across all spheres of power, making it necessary for national states to adopt measures to balance these circumstances—especially in the case of Brazil, where the implementation of processes aimed at achieving endogenous innovation-led development began relatively late.

In this context, the objective of this research is to highlight how Innovation, within the framework of Science, Technology, and Innovation (ST&I), serves as a strategic driver for Brazilian National Development. The study is based on the hypothesis that Innovation, when incorporated into public policies aligned with a consistent national strategy, becomes a central vector for economic, social, and political transformation. It is capable of narrowing the technological gap and strengthening national autonomy and sovereignty.

To that end, the study first identifies various concepts and interpretations of ST&I, with a particular focus on the definitions offered by Waldimir Pirró and Longo. Next, it examines Brazil's legislative history, given that its late awakening to the importance of Innovation makes it essential to understand the normative integration of innovation and its impact on National Development.

Accordingly, the research begins from the fundamental premise that Innovation, when applied to public policy, transcends conventional norms established in the economic sphere. This study is justified by the need to understand Innovation not merely as a tool for modernization, but as a structuring axis of state policies focused on strategic planning and the consolidation of national sovereignty.

The hypothetical-deductive methodology was employed, using bibliographic and documentary research, with particular attention to articles and documents addressing ST&I and national development policies. Key conceptual references include Longo (1984) and Dyer, Gregersen, and Christensen (2018).

The study also revisits the Brazilian legal framework to understand how Innovation was introduced and structured to create favorable conditions for innovation processes. This is based on the premise that Innovation is more than just a modernization tool—it requires a legal foundation for the implementation of public policies that can truly impact National Development.

Finally, the structure of the paper is as follows: the first section addresses the fundamental concepts of ST&I and Innovation; the second analyzes the evolution of Brazilian legislation on the topic; the third explores the relationship between Innovation and National Development; and the fourth presents public policies and institutional mechanisms for promoting Innovation. The final considerations revisit the research objective, hypothesis, and key findings.

It is concluded that Innovation represents a driving force against complacency with the status quo, as it fosters the creation of an environment conducive to the development of disruptive ideas. The formulation and implementation of public policies aimed at promoting Innovation—with an emphasis on supporting research, technological development, and the application of innovative strategies—prove capable of generating tangible benefits for society.

2 CONCEPTS AND UNDERSTANDINGS OF SCIENCE, TECHNOLOGY, AND INNOVATION

Technological Innovation is a recurring theme in contemporary society, resulting in constant updates across a wide range of products and services. This includes everything from the release of new versions of mobile devices to the introduction of innovative shopping methods and entirely new products.

Innovation is increasingly seen as essential to humanity; however, its conceptual understanding and its cross-cutting relevance within the context of National Development require in-depth analysis. Therefore, this research seeks to understand and identify what Innovation is and what it can be—from its conceptual foundations to the criteria used to evaluate whether something can indeed be considered innovative.

Koselleck (1992, pp. 136–137) explains that every concept is developed within a specific context, interwoven with a web of questions and answers, texts and contexts from general knowledge. Thus, this study

begins by analyzing Science, Technology, Innovation, and Development as interrelated concepts.

Initially, guidance on the definition of these terms is sought in the works of Waldimir Pirró and Longo. With regard to the concept of Science, it can be defined as an "organized body of knowledge relating to the objective universe, involving its natural, environmental, and behavioral phenomena" (Longo, 1984, p. 9).

In the current context, it is relevant to emphasize that Science is conceived as a fundamental methodological approach. Its main purpose is the generation of knowledge based on reliable empirical evidence. In this sense, by formulating questions and research hypotheses, it becomes possible to construct theories, which are subject to ongoing revision and improvement.

According to Galdino (2017, p. 36), science constitutes a body of knowledge belonging to all humanity:

> It is the organized body of knowledge related to the Universe, encompassing its natural, environmental, and behavioral phenomena. Scientific knowledge aims to explain the phenomena of the universe and to seek the truth. It represents a public good and constitutes a heritage of humanity.

Therefore, it is possible to conclude that Science effectively produces scientific knowledge through research or scientific investigation, following a set of defined steps and methodologies, beginning with the identification of questions arising from the observation of phenomena. Within scientific research, it is important to consider the two essential branches of Science: basic scientific research and applied research.

Basic research, also referred to as pure or fundamental research, aims to generate new knowledge without being tied to specific objectives. Its development occurs freely and is not immediately associated with practical applications (Longo, 1984, p. 9). The purpose is to enrich the body of knowledge, which may later serve as the foundation for further scientific investigations that lead to practical advancements and significant applications.

In applied research, the goal is to find specific solutions to

predefined problems from the outset of the investigation. This type of research is primarily focused on producing practical and applicable answers to concrete issues. It directly addresses real-world problems and aims to resolve them effectively.

Longo (1984, p. 9) highlights that in the past, scientists were primarily concerned with the discovery and understanding of universal phenomena, with little regard for the potential implications of their discoveries. Today, however, there is a growing interest in the practical consequences of these findings, beyond the mere pursuit of understanding.

To define the concept of Technology, Longo (1984, p. 10) notes that some authors view it as the application of Science, but emphasizes that this definition is not always applicable. There are instances where certain inventions are not directly linked to scientific knowledge, yet they can still result in significant transformations.

Menezes (2008, p. 15) points out that "it is technology that drives the pursuit of greater profits through differentiation," emphasizing that competition becomes a key condition for the survival and success of companies. He also notes that technological innovation is a dynamic process dependent on the social and institutional structures that support it.

These observations underscore the importance of technology and innovation in the pursuit of competitive advantages and in differentiating products and services in the marketplace. Moreover, they stress that innovation is not an isolated process but a phenomenon that depends on a favorable social and institutional context in order to thrive. In an increasingly technology-driven and competitive world, the ability to innovate and adapt has become essential for business success.

> Technological innovation is not a singular or static process; on the contrary, it is dynamic and must be continuous. It is influenced by several factors, such as the interaction between researchers, the organizational structure of the company, and the economic, political, and social environment, among others. Conversely, innovations are only viable if there is, in fact, interaction between social and institutional structures within a concerted effort toward

> innovation—in other words, a setting that is conducive to innovative activities. (Menezes, 2008, p. 19).

For the purposes of this research, the main concept of technological Innovation is intrinsically linked to the economic aspect. This will allow for an understanding of the creation of new markets, services, and goods, as well as the goal of viewing Innovation as a lever for National Development in all its dimensions — economic development and defense.

Technology is understood as a body of knowledge encompassing scientific, empirical, and intuitive elements. Therefore, technology is defined as a system of activities that includes research, experimental development, and engineering (Longo, 1984, p. 11).

To explore the concept of Innovation, Baptista (1999) makes an etymological observation that the word "Innovation" has its roots in the Latin language, more precisely in "innovatione," which translates as "renewal." The etymology of the word itself suggests the idea of bringing changes, renewals, and novelties.

Innovation is related to the introduction of something new, whether in terms of products, processes, methods, technologies, or ideas, with the objective of improving or transforming existing situations. Tigre (2006, p. 86) understands that conceptualization is essential; the author justifies this by stating that "innovation only produces broad economic impacts when it diffuses widely among companies, sectors, and regions, triggering new ventures and creating new markets."

Kotler (2004, p. 30) defines Innovation as follows:

> Innovation is the key and foundation of today's competitive strategies. The pace of new product launches is frenetic, but the risk of failure is high. It is absolutely crucial to understand how innovation is done nowadays (...) so that we can comprehend the kind of novelty it may produce.

Kilian (2005, p. 22) highlights that "innovations represent the objective result of the ability to break away from traditional forms of creation." Nowadays, it is unsustainable to remain limited to reproductive thinking and repetitive work. What becomes necessary is the combination

of productive thinking with innovative action, seeking, as a consequence, the achievement of a competitive advantage.

It is essential to emphasize that Innovation can be understood as a disruptive means of creation—that is, the ability to innovate can be acquired and is not exclusive to genetic inheritance. Thus, what is called disruptive Innovation does not depend on genetic predispositions but is the result of stimulation and learning—that is, through disruptive education (Dyer, Gregersen, Christensen, 2018, p. 27).

Schumpeter (1961, p. 134), when explaining that "perfect competition implies free access to all industries," recognizes that the essence of economic development lies in disturbances of the productive routine, caused by agents who introduce any Innovation. Therefore, the disruption caused by Innovation should be associated with the concept of creative destruction—the process by which innovations and technologies render old ones obsolete, resulting in paradigm shifts.

Hence, Innovation has the potential to result in new markets, new products or services, and even a new quality or approach to something introduced into society (Cavalcante, 2017, p. 16). Therefore, the ability to innovate is an accessible skill for individuals and organizations that adapt, evolve, and stand out in the ever-changing competitive landscape.

In Law No. 13,243/2016, the concept of Innovation was defined as:

> (...)
> IV – Innovation: the introduction of novelty or improvement in the productive and social environment that results in new products, services, or processes, or that involves the addition of new functionalities or characteristics to an existing product, service, or process, which may lead to improvements and actual gains in quality or performance;
> (...)

It is important to consider that, although legislation provides specific definitions of Innovation in the context of products, a disruptive approach is necessary. Innovation emerges from associative, atypical, and synthesizing thinking (Dyer, Gregersen, Christensen, 2018, p. 28). To promote Innovation, it is essential to create an environment conducive to

creativity and the educational development of innovative individuals.

From a collaboration between the Organisation for Economic Co-operation and Development (OECD) and the European Union's Statistical Office (Eurostat), the Oslo Manual was developed—a methodological guide that provides standardized guidelines for the collection and interpretation of data on Technological Innovation (OECD, 2018, p. 12).

From this manual, the following definition of Innovation can be derived:

> Innovation is seen as a dynamic process in which knowledge is accumulated through learning and interaction. (…)
> Innovation requires the use of new knowledge or a new use or combination of existing knowledge. (…)
> Innovations are defined in the Manual as significant changes, intended to distinguish them from routine and minor changes. However, it is important to recognize that an innovation can also consist of a series of small incremental changes. (OECD, 2018, pp. 41-50).

It is also essential to address Entrepreneurship, which plays a vital role in promoting Innovation and, by extension, national development. As noted by Brasil (2022, p. 161), creating a favorable environment for Innovation in Brazil requires both regulatory and non-regulatory measures that encourage entrepreneurship.

Dornelas (2008, p. 9) states that "Entrepreneurship is the fuel for economic growth, creating jobs and prosperity." Therefore, it is assumed that Entrepreneurship can drive the country's economy and competitiveness. The definition of Entrepreneurship provided by Dornelas (2017, p. 26) emphasizes that it is a behavior deeply associated with a propensity for action.

This means that Entrepreneurship involves the willingness to think differently, continuously seek opportunities, and challenge the status quo. This entrepreneurial behavior triggers a break from conventional behavioral patterns, fostering Innovation and the pursuit of creative solutions..

> The idea of attributing entrepreneurship solely to the creation of new businesses is very limited. When entrepreneurship is analyzed from a broader perspective, taking into account the key aspects related to the topic, it becomes clear that this concept can be applied within established organizations and can even enable these organizations to gain a competitive edge.

Research and Development (R&D) plays a crucial role in supporting Entrepreneurship and Innovation. It can be defined as "creative work carried out systematically to increase the stock of knowledge" (OECD, 2018, p. 67). Innovation, therefore, is an essential factor for economic growth and technological advancement, representing a driving force in the pursuit of creative and effective solutions to the challenges of the contemporary world.

Tigre (2006, p. 89) emphasizes that Innovations can be differentiated according to the types of changes they cause and their characteristics, as illustrated in the table below:

Table 1 – Types of Innovation.

Type of Change	Characteristics
Incremental	Daily improvements
Radical	Discontinuous leaps in product and process technology
New technological system	Changes affecting more than one sector and giving rise to new economic activities
New techno-economic paradigm	Changes involving the entire economy, with technical and organizational alterations, creating products, processes, industries, and innovation trajectories

Source: Adapted from Freeman, 1974, as cited in Tigre, 2006, p. 89.

It is important to highlight here the relationship between Innovation and National Development, with a central role in economic growth, since Innovation has the power to generate cycles of new market creation. In this context, Freeman (1974), as cited in Menezes (2008, p. 18), undertakes the mapping of degrees of uncertainty related to the risks of not obtaining a return on investment in technology. This involves the

collection of data and information that support decision-making aimed at economic growth.

Ribas (2023, p. 19) explains that resources, whether financial, human, or material, are often limited; understanding how uncertainty is associated with technology investments allows companies to optimize the allocation of these resources.

Thus, by knowing the degrees of uncertainty in Innovation, it is possible to direct resources more efficiently toward projects with lower uncertainty or to implement risk mitigation strategies, as exemplified below:

Table 2 – Degrees of Innovation Uncertainty.

Degree of Uncertainty	Type of Innovation
True uncertainty	Basic research
Very high degree of uncertainty	Radical innovation in products and processes carried out outside the company
High degree of uncertainty	Significant innovation in products and radical in processes carried out within the company
Moderate degree of uncertainty	New generation of already established products
Low uncertainty	Licensing of innovations; imitation of product innovations; modification in products and processes; adoption of processes
Very low uncertainty	New established product model; product differentiation; brokerage of innovation of established products; adoption of processes and small technical improvements in products and processes

Source: Adapted from Freeman, 1974, as cited in Menezes, 2008, p. 18.

It is essential to emphasize that the term National Development is not limited solely to the country's material and financial growth but also encompasses the "valorization of the human being, the improvement of social systems, and ultimately the pursuit of better quality of life for society" (Escola Superior de Guerra, 2019).

In light of the above, the essential concepts to understand the research in question are established. We are experiencing a digital revolution that goes beyond technological aspects, as it is generating significant transformations in the economy and society, both in Brazil and globally (Confederação Nacional da Indústria, 2020).

Therefore, the close interconnection between Innovation, competitiveness, and the achievement of National Development goals is

demonstrated, encompassing both economic growth and social well-being and human dignity.

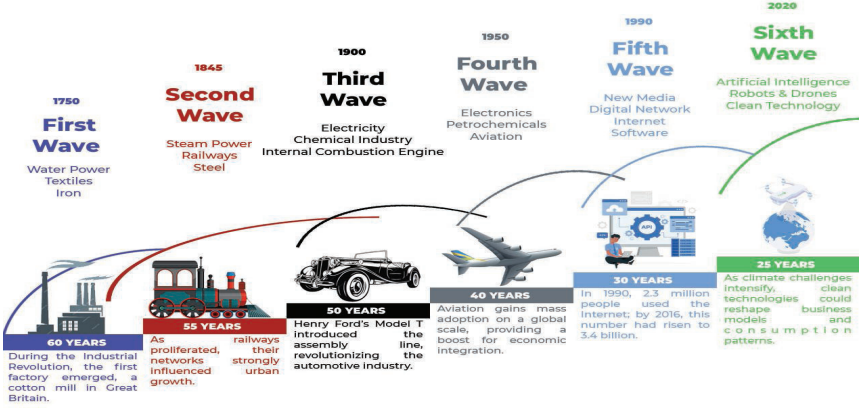
3 INNOVATION AND LEGISLATION

At the beginning of the Constitution of the Federative Republic of Brazil of 1988 (Art. 1), one encounters the country's fundamental principles: sovereignty, citizenship, human dignity, the social values of labor and free enterprise, and political pluralism. National Development must be pursued based on these foundations.

Regarding the constitutional order, Ribas (2023, p. 22) explains that the aim is to find ways to enforce and protect National Sovereignty, as well as to develop public policies that encourage and guarantee citizenship, human dignity, and the social values of labor and free enterprise.

Innovation cycles drive efficiency, productivity, and competitiveness across different sectors of the economy. This can be observed through waves and cycles of Innovation, as illustrated in the image below:

Figure 1. Innovation Cycles.



Source: Adapted from Neufeld (2021).

Recognizing these changes, Brazil must encourage Innovation in order to harness the potential of these Innovation cycles. Policies and strategies need to be adaptable and agile, given the dynamic nature of Innovation waves, to maximize benefits for the country.

With a stronger emphasis due to constitutional prescription, efforts are made to find ways to promote National Development, as well as to foster public policies that encourage and guarantee citizenship and human dignity, the social values of labor and free enterprise, in addition to protecting and promoting political pluralism.

As each of these issues is examined individually, it is imperative to consider the principles of the 1988 Constitution as a guiding framework that unifies the pursuit of National Development. This guiding framework must incorporate Innovation because, regardless of how they are adopted, "technological and organizational innovations are the catalysts for the formation, adaptation, and often the complete overhaul of the existing order" (Campos, 2015, p. 11).

It is essential to highlight that, until the unfolding of World War II (1939–1945), Brazil had a very small number of scientists. There were no significant research environments in universities, and the industrial sector was in its early stages (Brazil, 2005, p. 3). From the 1950s onward, a set of policies aimed at stimulating research began to be implemented, as evidenced in the following table:

Table 3 – History of S&T&I Actions Between 1950-1985.

YEAR	ACTION
1951	Creation of CNPq and CAPES
1963	Creation of FUNTEC at BNDES
1967	Creation of Finep
1968	University Reform
1971	Implementation of FNDCT/Finep
1973	Second Basic Plan for Scientific and Technological Development
1985	Creation of the Ministry of Science and Technology

Source: Own elaboration.

Analyzing the previous table, from 1990 onward, there have been greater initiatives and public policies aimed at Science, Technology, and Innovation (ST&I), influenced by model countries, since developed countries emphasize, in economic terms, the importance of increasing competitiveness through relationships between companies and innovation practices (Marini, 2011, p. 18).

When comparing Brazil with countries considered developed, a significant technological gap is observed. These countries are not competing directly due to the disparity in their development levels, and there is a

noticeable gap in their capabilities. For this reason, the implementation of legislation related to Science, Technology, and Innovation (ST&I) practices is of great importance.

Despite this technological mismatch in Brazil compared to other countries, notable progress has been made in recognizing the need for investments in Technology and Innovation. Brazil shows a structural dependence on international technology but has started organizing industrial parks (clusters) and enacting laws aimed at promoting the implementation and encouragement of an endogenous technology production system (Moraes, 2016, p. 3).

Before addressing the consolidation of a Legal Framework for Science, Technology, and Innovation (ST&I), it is important to highlight the relevance of Law No. 9,279/1996, known as the Patent Law. This legislation regulated the rights and obligations related to industrial property, aiming to provide security to inventors of new products, processes, or models.

The Patent Law played a crucial role in ensuring protection for inventors because, as Amarante (2009, p. 274) states, over the last 190 years of the Industrial Revolution, the world experienced a true and immense metamorphosis. From the 2000s onward, attempts were made to establish an ST&I policy, but there was a lack of proper regulation for the policies implemented, which resulted in limited effectiveness in promoting innovation.

Marini (2011, p. 21) mentions the creation of the "Lei do Bem" (Law No. 11,196/2005), which sought to establish incentives for the deduction of expenses related to innovation by companies. With this law, the rate of the Tax on Industrialized Products (IPI) applied to the acquisition of physical resources for research and technological development was reduced, providing a 60% subsidy on the remuneration of masters and PhDs involved in innovation activities.

Despite the progress achieved and prior attempts at a solid Science, Technology, and Innovation (ST&I) policy, the Legal Framework effectively took shape between 2015 and 2018, with legal acts incorporated into the legal system, providing greater consistency to the ST&I sector. As noted by Benfatti (2021, p. 114), there are approximately 175 federal laws that address the topic of innovation, either directly or indirectly.

One of the fundamental milestones in the formation of the Legal Framework for Science, Technology, and Innovation (ST&I) was Constitutional Amendment No. 85/2015. It represented the starting point

for technological innovation perspectives incorporated into Brazilian society.

Furthermore, the State assumed responsibility for promoting and encouraging ST&I, covering both basic and technological scientific research, which received priority treatment from the State. This focus aims at the public good and the progress of ST&I in Brazil, highlighted by the updates introduced at the constitutional level:

> (...)
> Art. 218. The State shall promote and encourage scientific development, research, scientific and technological training, and innovation.
> § 1 The State shall give priority treatment to basic and technological scientific research, considering the public good and the advancement of science, technology, and innovation.
> § 2 Technological research shall be primarily directed toward solving Brazilian problems and the development of the national and regional productive system.
> (...)

With the introduction of these provisions, substantial updates occurred, including assigning to the National System of Science, Technology, and Innovation (SNCTI) the role of promoting and developing Innovation. Furthermore, shared responsibility was established among the Union, States, Federal District, and Municipalities to create mechanisms for access to Science, Technology, Research, Development, and Innovation.

Before Constitutional Amendment No. 85/2015, Brazil already had Law No. 10,973/2004, known as the Technological Innovation Law (LIT). However, it lacked proper regulation and updating regarding the establishment of incentive measures for innovation and scientific and technological research in the productive environment, aiming to promote capacity-building, technological autonomy, and the country's industrial development.

With the regulation of the LIT, Kruglianskas and Matias-Pereira (2005, pp. 1021-1022) highlight that this implied a series of changes in the behavior of research institutions. Despite praise for the firm policy, the

authors also point out shortcomings in several aspects:

> The content of the LIT and its regulation proves to be particularly deficient in aspects involving the management flexibility of research institutions, as well as matters related to the competencies of other ministries. It is also necessary to address the process of harmonizing its provisions with other legal statutes that regulate the subject in the country.

In accordance with the criticisms presented by Kruglianskas and Matias-Pereira, there arose a need for legislation that would regulate and influence other legal instruments related to Science, Technology, and Innovation (ST&I). In this context, Law No. 13,243/2016 was enacted to establish guidelines related to incentives for scientific development, research, scientific and technological capacity building, and innovation.

Three main areas of action were introduced: the encouragement of creating specialized and collaborative innovation environments, with support from the Union, States, Municipalities, and the Federal District; the stimulation of the participation of Scientific, Technological, and Innovation Institutions (ST&I Institutions) in the innovation process; and the promotion of innovation within companies.

Law No. 13,243/2016 needed to define, in its Article 2, the concepts within its legislation, such as the definition of ST&I Institutions:

> (...) a body or entity of the direct or indirect public administration or a private non-profit legal entity legally established under Brazilian law, with headquarters and jurisdiction in the country, that includes in its institutional mission or social or statutory objective basic or applied research of a scientific or technological nature or the development of new products, services, or processes;

Following the approach to stimulate Science, Technology, and Innovation (ST&I), Decree No. 9,283/2018 was enacted, regulating

and establishing incentive measures for Innovation and scientific and technological research in the productive environment, with the aim of promoting technological capacity building, achieving technological autonomy, and boosting the development of the productive system at both national and regional levels.

The Decree established a managing entity as a public or private legal entity responsible for managing innovation-promoting environments, dividing these environments—spaces conducive to Innovation and Entrepreneurship—into two dimensions: innovation ecosystems and venture creation mechanisms.

Two policies were instituted and implemented: the National Innovation Policy (PNI), dated October 28, 2020, and the more recent National Policy for the Defense Industrial Base (PNBID), dated August 10, 2022. In Brazil, Innovation policies have gained prominence more recently compared to developed countries or nations that prioritized technological development in their domestic markets.

The State recognized the critical importance of planning focused on stimulating and promoting Innovation. Santos and Ribas (2020, p. 632) highlight that planning is the way to establish connections and integration between rules and principles:

> The understanding of planning presupposes an integrative methodology in an interpretation that considers the constitutional unity to promote connection and integration among rules and principles across various dimensions: economic; social; environmental; financial; State; rights and guarantees; security and defense. (...) In terms of planning and execution (both programmed and verified), this approach qualifies the results to achieve the fundamental objectives of the State.

The National Innovation Policy established principles, objectives, and especially key areas to be addressed: education, technological base, markets, innovation culture, knowledge protection, and promotion of innovation. Through the NIP, guidelines were defined to steer strategy and action plans. It is evident that, although initiated in 2004, the work to effectively integrate Science, Technology, and Innovation (ST&I) only took

place in the last decade.

The ultimate goal of the NIP is to expand national technological capabilities in order to ensure the ability to produce new technologies that increase competitiveness and economic growth. However, there are various factors that influence this goal. Negri, Chiarini, and Koeller (2021, p. 1) explain how certain factors escape the control of public instruments:

> The regulatory macroeconomic environment, the international scenario, the availability of infrastructure, and the educational level affect companies' capacity for innovation and are often beyond the reach of the instruments available to innovation policies.

Moreira (2012, p. 84) points out that when knowledge transformed into Innovation has the potential to leverage military power, protective barriers rise and "technological containment" occurs. Ribas (2023, p. 28) explains that the concept involves practices aimed at limiting or denying access to or possession of sensitive technologies and goods by third parties.

Regarding the containment of the technology transfer process, Longo and Moreira (2013, p. 295) note that demands on the sectoral Innovation system depend on the procedures adopted for defense acquisitions. The technological choices and the selected development and production methods define the type of order and associated risks, influencing the actions and reactions of the Security and Defense Sector.

The sectoral Innovation system requires a wide range of skills in various areas, including project management, research and development, industrial property, negotiation and technology transfer contracts, technology scouting, engineering, lifecycle cost analysis, public finance, trade agreements, acquisitions and external oversight (audits), and legislative support. The efficiency and effectiveness of technology transfer contracts depend on these competencies (Longo; Moreira, 2013, p. 296).

In this regard, it is important to highlight the Defense Technological, Industrial, and Commercial Compensation Policy (PComTIC), established by GM-MD Ordinance No. 3,990/2023, as a tool aimed at internalizing technological and industrial capacities in the defense sector. Indeed, guidelines have been established so that the acquisition of goods and services from foreign suppliers is conditioned on countermeasures that

benefit the Defense Industrial Base (BID).

Thus, with the consolidation of institutional CT&I policies, there is a possibility to reduce the technological containment suffered by less developed countries due to the technological gap. Santos (2023, p. 176) points out that there are several factors to consider when talking about reducing the gap until its elimination, one of which is the process of deindustrialization, highlighting the need for integrative policies — policies that include the industrial sector, the defense industrial base, and technological Innovation.

Longo (1978, p. 27) explains that from the perspective of a national Development strategy, technology transfer becomes fundamental for establishing a base on which to support the pursuit of sovereignty in the productive sector. There is a harmful effect arising from the indiscriminate importation of technology — according to the author, indiscriminate importation results in blocking the emergence of endogenous technologies.

Therefore, incentives should be sought to promote national technology production to nationalize the processes that are currently imported and escape the technological containment that affects less developed countries (LDCs). Longo and Moreira (2018, p. 75) explain:

> Although containment practices have been based on meritorious objectives and/or defined targets, such procedures have been used by developed countries to maintain strategic advantages—not only military but also commercial—achieved thanks to the valuable knowledge they hold through their companies.

The existence of legislation that allows the development of public policies boosts greater internal incentives and the possibility of obtaining endogenous Technology and Innovation, considering that technology transfer processes are costly and complex.

This generates institutional research projects that increase the relevance of knowledge transfer flows and also enhance national competitiveness, resulting in local and regional development.

4 INNOVATION AND NATIONAL DEVELOPMENT

The priority mentioned by the 1988 Federal Constitution of Brazil (CRFB/88) was vague regarding the specific nature of the priority treatment that Science, Technology, and Innovation (ST&I) policies should receive; what was expected was that Decree No. 534/2020 would provide clearer guidelines on how this would be implemented. According to Negri, Chiarini, and Koeller (2021, p. 5), the strategy still faces common problems seen in other attempts to establish an Innovation Policy, as fragmentation and a lack of priorities persist.

Negri, Chiarini, and Koeller (2021, p. 4) point out that there is a lack of specific objectives, resulting in goals disconnected from reality. This is because the goals in the National Innovation Policy (PNI) are too broad, seemingly ignoring many other factors. What is observed is that Brazil remains a country still considered developing, for various reasons, one of which is the failure to overcome technological heterogeneity among internal sectors.

Santos and Corrêa (2023, p. 126, free translation) emphasize that "the relevance of scientific and technological activity permeates human activity as a whole and cannot be ignored[3]," and that priority should be given to integrating the governmental, industrial, and academic sectors oriented toward ST&I in pursuit of national technological autonomy. The technological gap separates countries that are already at a level where they maintain investments in Innovation policies rather than creating and organizing such policies. Santos and Corrêa (2023, p. 128, free translation) further explain:

> In this context, it is very likely that, due to the widening technological gap between countries, those nations lacking cutting-edge technological resources will require occasional political, economic, and military alignments that impose limits on their autonomy and sovereignty. Therefore, it is fair to say that this technological disparity becomes one of the main threats to Ibero-American countries on the international stage[4].

3 The relevance of scientific and technological activity permeates all areas of human activity and cannot be ignored.

4 In this context, it is very likely that, due to the increasing technological gap between

Moreira (2013, p. 24) points out that "contemporary science and its technological applications have leveraged the economic, military, and consequently political potential of countries that were able to take the lead in terms of scientific production and innovation." In other words, with modern science, the economic and political potentials of nations are boosted through the continuous generation of scientific knowledge and the implementation of innovations.

Thus, it is understood that modern science and innovation not only drive economic progress but also play a decisive role in the political projection of nations on the international stage. Although Brazil has been late in promoting technological innovation in its policies, there are examples such as Technology Parks, initially created through State Laws, which have been incorporated into the legal framework through item X of Law 13,243/2016.

> X - technology park: a planned complex for business and technological development, promoting a culture of innovation, industrial competitiveness, business capacity-building, and the fostering of synergies in activities of scientific research, technological development, and innovation, among companies and one or more Scientific, Technological, and Innovation Institutions (ICTs), whether or not linked to each other;

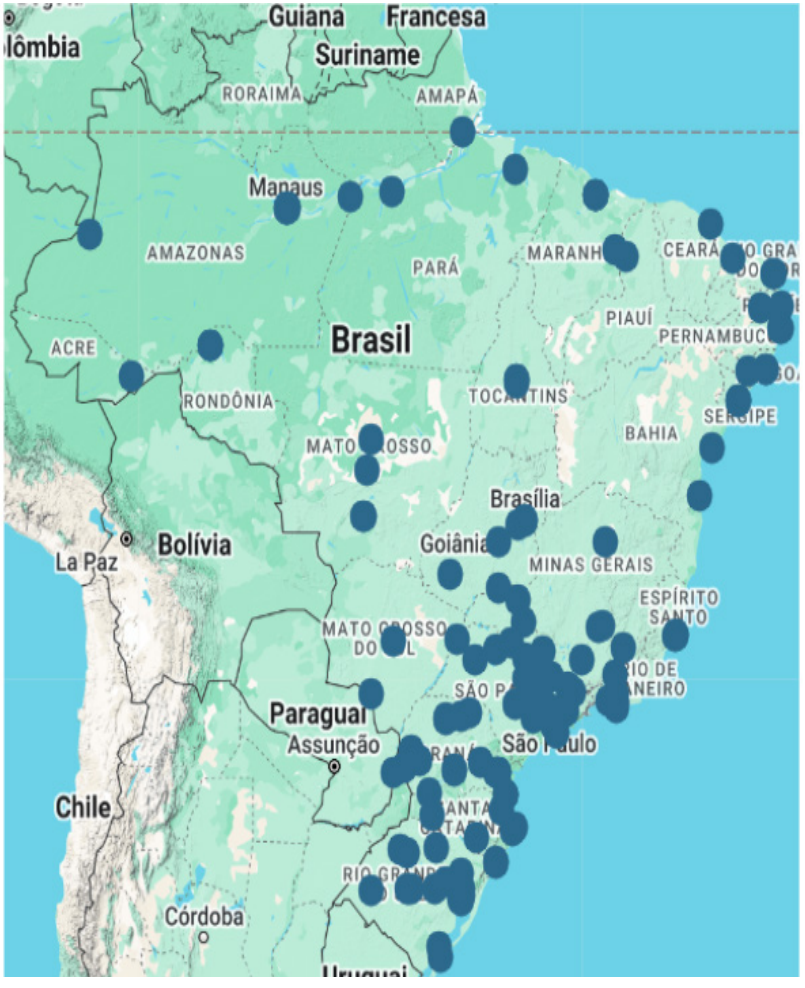
Steiner, Cassim, and Robazzi (2019, p. 2) define Technology Parks as innovation environments and instruments implemented in both developed and developing countries to stimulate regional and national economies. Faria et al. (2021, p. 18) explain that there are various types of parks, including Scientific, Technological, Research, University Parks, and others, with no consensus on the success of each due to the absence of common evaluation metrics, stemming from different legal, management,

countries, those nations lacking cutting-edge technological resources will require occasional political, economic, and military alignments that will impose limits on their autonomy and sovereignty. Therefore, it is fair to say that this technological level disparity becomes one of the main threats to Ibero-American countries in the international arena.

and governance models.

The Ministry of Science, Technology, and Innovation (MCTI) operates the InovaData platform, from which it can be seen that, as of June 2025, there are 64 active parks, 42 under development, and 7 in planning stages, involving 2,706 private companies. In 2023, there were 57 parks in operation, 42 under development, 7 in planning, and 2,321 companies involved.

Figure 2 – Technology Parks in Brazil.



Source: Brazil (2025).

Technological Parks face challenges arising from difficulties in implementing public Innovation policies. These obstacles range from hiring qualified labor, finding institutions and companies capable of retaining such professionals, to financial issues involved in making these hires. One example is the complexity involved in recruiting highly qualified personnel.

Carneiro et al. (2020, p. 9) point out the existence of a scientific diaspora—highly qualified individuals seeking job opportunities abroad—resulting in difficulties retaining talent within the country. Due to this diaspora, there is an insufficient number of qualified professionals. At this point, it is necessary to mention Viegas and Santos (2019, p. 76), who explain that technological autonomy goes beyond the private sector context and that it is important to demystify the idea that technological innovation is limited to private companies:

> It is also worth noting that achieving technological autonomy is part of the objectives of the most recent government policies and actions aimed at promoting Science, Technology, and Innovation (ST&I), yet with the perspective of technological autonomy of the productive system somewhat disconnected from the national state context.

Besides demystifying the concept that Innovation is exclusively confined to the private sector, it is imperative to highlight the importance of understanding that technological autonomy is intrinsically linked to National Sovereignty. The connection between technological independence and the ability to defend the nation cannot be underestimated. The defense of the country and the advancement of its national goals are inseparable from the achievement of technological independence.

Galdino (2017, p. 202) states that:

> Scientific and technological dependence limits Sovereignty, creates obstacles to national development, restricts freedom of action, and hinders autonomy in the areas of Defense and National Security. Throughout human history, there have been no strong nations that did not

> possess technological mastery and independence in strategic and critical areas at each historical moment.

It has become crucial to seek national technological independence, an essential imperative to ensure the protection of state sovereignty in an increasingly interconnected and technology-dependent world. This need is evidenced by the fact that the creation and implementation of policies to disseminate innovation are no longer solely concerns of the private sector but also critical responsibilities of the government and public institutions.

In this regard, policies such as the New Industry Brazil (NIB)—especially its Mission 6, focused on sovereignty and technological autonomy—the Growth Acceleration Program (PAC) 2023, and the National Defense Industrial Base Policy, through Decree No. 11,169/2022, highlight a deliberate national strategy to strengthen strategic technological capabilities, that is, Brazilian reindustrialization.

Moraes (2024, p. 118) points out that "with the NIB, the country joins the global trend of the resurgence of the developmental state as the driver of industrial policy." This understanding is reinforced by Schumpeter (1961, p. 105), who observed that development occurs precisely when the economy is displaced from its equilibrium position and the productive structure is permanently altered.

Therefore, a critical evaluation of the currently implemented innovation policies is undertaken, identifying areas open to improvement and assessing the relevance of the adopted strategies. It is imperative, then, to consider the formulation of new policies that encourage the advancement of national technology, promote scientific research, foster high-quality education, and incentivize collaboration between the public and private sectors.

The formulation of new policies plays a crucial role in promoting national technological advancement. These policies should not only encourage cutting-edge scientific research but also create an environment conducive to experimentation and innovation. Here, it is evident that collaboration between the public and private sectors is a vital dimension of these policies. Such partnerships are strategic and can catalyze technological transformation by enabling knowledge and resources to be shared efficiently.

In the Brazilian context, the Financing Agency for Studies and

Projects (Finep), a public company linked to the Ministry of Science, Technology, and Innovation (MCTI), founded in 1967, stands out. It plays a fundamental role as the main governmental institution responsible for public funding in Science, Technology, and Innovation (ST&I), being the first Brazilian institution aligned with the Oslo Manual and responsible for providing direct support to innovation.

This support ranges from funding research and development projects to granting resources to companies aiming to improve innovative products, processes, and services. As of June 2025, Finep had 21 programs and products to support and finance innovative activities, each with its own proposal submission rules (Finep, 2025a).

To obtain support or funding, certain programs conduct a selection of Strategic Innovation Plans (PEIs), which are submitted to Finep and analyzed based on the degree of innovation, relevance, and potential impact on the affected economic sector, as well as their alignment with priorities defined by the New Industry Brazil (NIB), thus ensuring that resources are directed to projects that promote technological advancement and competitiveness.

Table 4 – Action Lines at Finep.

ACTION LINE	DESCRIPTION
Finep More Innovation	Aimed at PEIs related to priorities defined by the New Industry Brazil (NIB), with a high degree of innovation and relevance for the benefiting economic sector.
Pioneering Innovation	For PEIs related to priorities defined by the NIB that result in the development of products, processes, or services that are unprecedented in Brazil.
Innovation for Competitiveness	Aimed at PEIs related to priorities defined by the NIB, focused on the development or high improvement of products, processes, or services with the potential to impact the company's competitiveness in the market.
Innovation for Performance	For PEIs related to priorities defined by the NIB that result in innovations in products, processes, or services within the company, with possible limited impact on the economic sector in which they operate, such as technological upgrading through absorption or acquisition of technology, impacting productivity, cost structure, or company performance.
Technological Diffusion for Innovation	For PEIs based on the acquisition of machinery, equipment, services, IT goods, and automation, aiming at modernization and productivity increase, generating future gains.

Source: Adapted from Finep, 2025b.

As a public company funding Science, Technology, and Innovation (ST&I), Finep shows positive results aimed at reducing the technological gap between Brazil and foreign countries. Viegas (2017, p. 78) analyzes that:

> Additionally, such reports highlight success cases of supported projects, measured primarily by the characteristics of the products, processes, and services developed with the new technologies and proposed innovations; regional location; qualification of human resources allocated to the project; jobs created; contribution to environmental pollution improvement; among other indicators.

According to the 2023 Results Report of the National Fund for

Scientific and Technological Development (FNDCT), a significant volume of projects supported by Finep was completed, totaling over R$ 1.7 billion disbursed that year. The data demonstrate the continuity and effectiveness of public policies to promote Science, Technology, and Innovation (ST&I), considering instruments such as reimbursable credit (with R$ 1.3 billion disbursed) and financing to Scientific and Technological Institutions (ICTs) (R$ 379 million).

Table 5 – Amounts of completed projects supported by Finep in Brazilian reais.

Modality	Instrument	Projects Completed in 2022		Projects Completed in 2022	
		Contracted Amount	Disbursed Amount	Contracted Amount	Disbursed Amount
Non-reimbursable	Financing to ICTs	750.492.059	726.441.529	400.390.594	379.464.327
	Economic subsidy for companies	122.676.724	115.856.208	76.970.430	74.527.109
Reimbursable	Direct credit	1.546.485.515	1.269.478.183	1.362.889.008	1.306.251.235

Source: Finep, 2024, p. 7.

From the table presented, it is understood that Finep offers both repayable and non-repayable financing instruments. The repayable instruments aim to support innovative activities of Brazilian companies and increase competitiveness at the national and international levels, strengthening R&D&I activities carried out in the country. The non-repayable ones are directed toward national ICTs (public or private, nonprofit) and intended for scientific and technological development projects, as well as economic grants.

Although the 2024 FNDCT Results Report is not yet available, it was possible to observe from the 2024 MCTI Management Report (Finep, 2025c) that investments in strategic areas intensified throughout 2024, with a demand for repayable resources amounting to BRL 7 billion (Finep, 2025c, p. 29). Exclusively in the defense sector, approximately BRL 280 million was invested in R&D projects for strategic technologies through economic grants for innovation aimed at sovereignty and technological autonomy.

These investments prioritized sectors such as semiconductors, the defense industrial base, and critical technologies, in alignment with Mission 6 of the New Industry Brazil (NIB) (Finep, 2025c, p. 120). Although impact data (such as job creation or patent registration) have not yet been

released, execution indicators demonstrate the strengthening of the state's capacity to induce innovation in areas sensitive to development.

What is observed is alignment with the Schumpeterian concept that economic transformation is neither spontaneous nor homogeneous, but depends on the introduction of productive disruptions driven by agents who create new forms of organization, new products, and new markets (Schumpeter, 1961, p. 106). This is reaffirmed by the notion that, regarding approaches and methods for scenario building, decisions must be "based on a complex set of relationships among economic, political, technological, social, resource, and environmental factors, many of which are external to the company" (Corrêa, 2011, p. 68).

By anticipating future possibilities—from technological changes to market environment transformations—it becomes possible to position oneself more effectively to face imminent challenges as well as seize emerging opportunities. This provides a way to leverage technological innovation as a driver of national development.

Greater synergy among ministries, and between them and the States and municipal secretariats, supported by dynamic investment allocation in development processes, is essential to the effectiveness of a Grand National Strategy (GEN). State planning should focus on the national foundations (Article 1) and fundamental objectives of the Nation (Article 3), both from the Federal Constitution.

Through a strategy aligned with national interests, it is possible to encourage research and development, promote entrepreneurship, and foster the formation of qualified human capital. This creates an environment conducive to the emergence and growth of innovative companies that overcome challenges in security and defense, health, and education, strengthening the geopolitical position on the international stage.

It is considered that the planning and implementation of governmental actions play a fundamental role in promoting innovation in the Brazilian context. These incentives and instruments provided by Finep are key components in the implementation of the National Innovation Policy (PNI), as well as scenario-based planning, acting as the main mechanisms to drive Research, Development, and Innovation in the country.

FINAL CONSIDERATIONS

The objective of this research was to deepen the analysis of concepts and understandings related to Science, Technology & Innovation (ST&I), with an emphasis on how Technological Innovation can drive Brazil's National Development. In this regard, a solid starting point was established regarding the comprehension of ST&I, aiming to integrate Innovation into the context of Brazil's National Development.

Starting from the hypothesis that Technological Innovation can boost Brazil's National Development, it was concluded that, to create an effective industrial and technological policy that promotes National Development, it is necessary to reformulate the predominant focus of Brazil's industrial policies, which have historically prioritized manufacturing and export agribusiness.

In Brazil, innovation policies have only recently gained prominence compared to developed countries and nations that concentrated efforts on technological development for the domestic market. However, with the State's recognition of the fundamental need to plan and encourage Innovation, it becomes clear that this approach is necessary to promote a connection and integration between regulations and principles that drive the country's technological and economic progress.

To foster Innovation, it is imperative to recognize the importance of planning in the formulation of public policies based on disruptive education, grounded on a solid technological foundation and promoting an innovation culture. The evidence presented indicates that Brazil has the potential to become a reference in Technological Innovation, spanning from industry to the sciences.

In summary, this study reinforced the understanding of concepts surrounding Technological Innovation, demonstrating it as a fundamental element for national development in Brazil. However, a joint commitment between the public and private sectors is crucial, with investments in research, development, and technological infrastructure. Furthermore, it is necessary to foster strategic partnerships with educational institutions and research centers, promoting a culture of Innovation and Entrepreneurship.

Based on a proactive approach aimed at adopting cutting-edge technological solutions, Brazil has the capacity to boost its economic growth, improve the quality of life of its population, and consolidate its position on the international stage. Technological Innovation is not only a competitive differentiator but also a fundamental premise for the country

to overcome challenges and reach higher levels of development and social well-being.

Ultimately, Technological Innovation is the path that will allow Brazil to establish itself as a leading nation, capable of creatively and effectively addressing the challenges of the 21st century. The commitment to research, science, and the development of cutting-edge technologies will play a decisive role in guiding the country and contributing to the advancement of society as a whole.

Technological autonomy should be considered a strategic national goal and must be at the core of a Grand National Strategy. Achieving national defense and development will enable the consolidation of Brazil's international standing while protecting national sovereignty. It can be concluded that technological innovation is highly relevant to leverage national development, overcoming technological containment imposed by state and private actors, thus allowing the Brazilian State to achieve the social advancements pursued within the scope of National Development and Security.

REFERENCES

AMARANTE, José Carlos. **O voo da humanidade e 101 tecnologias que mudaram a face da Terra**. Rio de Janeiro: Biblioteca do Exército, 2009.

BAPTISTA, Paulo. A inovação dos produtos, processos e organizações. **Sociedade Portuguesa de Inovação (SPI)**, Porto, 1999. Disponível em: https://www.spi.pt/documents/books/inovint/ippo/experimentar.manual/1.1/cap_actua l.htm. Acesso em: 27 abr. 2023.

BENFATTI, Fábio Fernandes Neves. **Direito à Inovação**. Curitiba: CRV, 2021.

BRASIL. [Constituição (1988)]. **Constituição da República Federativa do Brasil**. Brasília, DF: Presidência da República, [2016]. Disponível em: http://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm. Acesso em: 22 fev. 2023.

BRASIL. **Decreto nº 9.283, de 7 de fevereiro de 2018**. Regulamenta a Lei nº 10.973, de 2 de dezembro de 2004, a Lei nº 13.243, de 11 de janeiro de 2016, o art. 24, § 3º, e o art. 32, § 7º, da Lei nº 8.666, de 21 de junho de 1993, o art. 1º da Lei nº 8.010, de 29 de março de 1990, e o art. 2º, caput, inciso I, alínea "g", da Lei nº 8.032, de 12 de abril de 1990, e altera o Decreto nº 6.759, de 5 de fevereiro de 2009, para estabelecer medidas de incentivo à inovação e à pesquisa científica e tecnológica no ambiente produtivo. Brasília, DF: Presidência da República, 2004. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/decreto/d9283.htm. Acesso em: 12 abr. 2023.

BRASIL. **Emenda Constitucional nº 85, de 26 de fevereiro de 2015**. Altera e adiciona dispositivos na Constituição Federal para atualizar o tratamento das atividades de ciência, tecnologia e inovação. Brasília, DF: Presidência da República, 2015. Disponível em: https://www.planalto.gov.br/ccivil_03/constituicao/emendas/emc/emc85.htm. Acesso em: 12 abr. 2023.

BRASIL. **Lei nº 9.279, de 14 de maio de 1996**. Regula direitos e obrigações relativos à propriedade industrial. Brasília, DF: Presidência da República, [1996]. Disponível em: http://www.planalto.gov.br/ccivil_03/leis/L9279.

htm. Acesso em: 03 mai. 2023.

BRASIL. **Lei nº 11.196, de 11 de novembro de 2005**. Institui o Regime Especial de Tributação para a Plataforma de Exportação de Serviços de Tecnologia da Informação - REPES, o Regime Especial de Aquisição de Bens de Capital para Empresas Exportadoras - RECAP e o Programa de Inclusão Digital; e dá outras providências. Brasília, DF: Presidência da República, 2005. Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2005/lei/l11196.htm. Acesso em: 03 mai. 2023.

BRASIL. **Lei nº 13.243, de 11 de janeiro de 2016**. Dispõe sobre estímulos ao desenvolvimento científico, à pesquisa, à capacitação científica e tecnológica e à inovação. Brasília, DF: Presidência da República, 2004. Disponível em: https://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2016/Lei/L13243.htm. Acesso em: 12 abr. 2023.

BRASIL. Ministério da Ciência. **Tecnologia e Inovação - MCTI**. InovaData Brasil. Brasília: MCTI, 2023. Disponível em: https://www.inovadata-br.ufv.br/. Acesso em: 12 nov. 2023.

BRASIL. Ministério da Economia. Secretaria Especial de Produtividade e Competitividade (SEPEC). **Política brasileira de produtividade e competitividade 2019-2022**: estudo para transição de Governo. Brasília, DF: SEPEC, 2022, 256 p.

BRASIL. **Decreto nº 11.169, de 10 de agosto de 2022**. Institui a Política Nacional da Base Industrial de Defesa - PNBID. Brasília, DF: Presidência da República, 2022. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2022/decreto/D11169.htm. Acesso em: 09 jun. 2025.

BRASIL. Ministério da Defesa. **Portaria GM-MD nº 3.990, de 3 de agosto de 2023**. Estabelece a Política de Compensação Tecnológica, Industrial e Comercial de Defesa – PComTIC Defesa. Diário Oficial da União: seção 1, Brasília, DF, n. 156, p. 18, 16 ago. 2023. Disponível em: https://www.in.gov.br/web/dou/-/portaria-gm-md-n-3.990-de-3-de-agosto-de-2023-503266530. Acesso em: 10 jun. 2025.

CAMPOS, Daniel Augusto Coração de. S**istemas de Inovação e Países**

em Desenvolvimento. 2015. 48 f. Monografia (Bacharel em Ciências Econômicas). Faculdade de Ciências e Letras, Universidade Estadual Paulista. Araraquara, 2015. Disponível em: https://repositorio.unesp.br/bitstream/handle/11449/149265/000873678.pdf. Acesso em: 03 mar. 2023.

CARNEIRO, Ana Maria; GIMENEZ, Ana Maria Nunes; GRANJA, Cintia Denise; BALBACHEVSKY, Elizabeth; CONSONI, Flavia; ANDRETTA, Victor Fidêncio. Diáspora brasileira de ciência, tecnologia e inovação: panorama, iniciativas auto-organizadas e políticas de engajamento. **Ideias**, Campinas, v. 11, 2020. Disponível em: https://periodicos.sbu.unicamp.br/ojs/index.php/ideias/article/view/8658500. Acesso em: 1 jul. 2023. DOI: 10.20396/ideias.v11i0.8658500.

CAVALCANTE, Pedro (org.). **Inovação no setor público**: teoria, tendências e casos no Brasil. Brasília: Enap / Ipea, 2017.

CONFEDERAÇÃO NACIONAL DA INDÚSTRIA. **Estudos e Prospectivas para o Futuro da Indústria**. Brasília: SESI/DN; SENAI/DN; IEL/NC, 2020.

CORRÊA, Cláudio Rodrigues. **Cenários Prospectivos e Aprendizado Organizacional em Planejamento Estratégico**: estudo de casos de grandes organizações brasileiras. 2011. 304 f. Tese (Doutorado em Administração) - Programa de Pós-Graduação em Administração, Instituto COPPEAD de Administração, Universidade Federal do Rio de Janeiro. Rio de Janeiro, 2011.

DORNELAS, José Carlos Assis. **Empreendedorismo**: transformando idéias em negócios. 3. ed. Rio de Janeiro: Elsevier, 2008.

DORNELAS, José Carlos Assis. **Empreendedorismo corporativo**: como ser empreendedor, inovar e se diferenciar na sua empresa. 3. ed. Rio de Janeiro: LTC, 2017.

DYER, Jeff; GREGERSEN, Hal; CHRISTENSEN, Clayton M. **DNA do inovador**: dominando as 5 habilidades dos inovadores de ruptura. Rio de Janeiro: Alta Books, 2018.

ESCOLA SUPERIOR DE GUERRA (ESG). **Fundamentos do Poder**

Nacional. Rio de Janeiro: Departamento de Estudos da Escola Superior de Guerra, 2019.

FARIA, Adriana Ferreira de; BATTISTI, Andressa Caroline de; SEDIYAMA, Jaqueline Akemi Suzuki; ALVES, Jeruza Haber; SILVÉRIO, José Antônio Silvério. (orgs.). **Parques Tecnológicos do Brasil**. Viçosa, MG: NTG/UFV, 2021.

FINANCIADORA DE ESTUDOS E PROJETOS (FINEP). **Condições Operacionais 2023**. Disponível em: http://www.finep.gov.br/images/a-finep/Condicoes_Operacionais/CondicoesOperacio nais.pdf. Acesso em: 02 mai. 2023.

FINANCIADORA DE ESTUDOS E PROJETOS (FINEP). **Relatório de Resultados do FNDCT 2021**. 2022. Disponível em: http://www.finep.gov.br/images/a-finep/FNDCT/2023/03_01_2022_Relatorio_de_Resultados_do_FNDCT_2021.pdf. Acesso em: 01 mai. 2023.

FINANCIADORA DE ESTUDOS E PROJETOS (FINEP). **Apoio e Financiamento**. 2025a. Disponível em: http://www.finep.gov.br/apoio-e-financiamento-externa/o-que-apoiamos. Acesso em: 09 jun. 2025.

FINANCIADORA DE ESTUDOS E PROJETOS (FINEP). **Condições Operacionais 2025**. 2025b. Disponível em: http://www.finep.gov.br/images/a-finep/Condicoes_Operacionais/CondicoesOperacionais.pdf. Acesso em: 09 jun. 2025.

FINANCIADORA DE ESTUDOS E PROJETOS (FINEP). **Relatório de Gestão Integrado do MCTI 2024 – Parte 1**. 2025c. Disponível em: http://www.finep.gov.br/images/a-finep/FNDCT/2025/26_05_2025_Relatorio_de_Gestao_MCTI_2024_parte1.pdf. Acesso em: 10 jun. 2025.

FINANCIADORA DE ESTUDOS E PROJETOS (FINEP). **Relatório de Resultados do FNDCT 2023**. 2024. Disponível em: http://www.finep.gov.br/images/a-finep/FNDCT/2024/29_10_2024_Relatorio_de_Resultados_do_FNDCT_2023.pdf. Acesso em: 08 jun. 2025.

GALDINO, Juraci Ferreira. **Análise de desempenho, modelagem**

e planejamento estratégico do Sistema de Inovação do Brasil: um estudo baseado nos indicadores do Global Innovation Index. 2017. 224 f. Monografia (Curso de Altos Estudos de Política e Estratégia). Departamento de Estudos da Escola Superior de Guerra, Escola Superior de Guerra (ESG). Rio de Janeiro, 2017.

KILIAN, Ana Paula. **Processo de geração de ideias fundamentado no pensamento lateral**. 2005. 176 f. Dissertação (Mestrado em Engenharia de Produção). Programa de Pós-graduação em Engenharia de Produção, Universidade Federal de Santa Catarina. Florianópolis, 2005. Disponível em: https://repositorio.ufsc.br/bitstream/handle/123456789/103005/222444.pdf?sequenc e=1&isAllowed=y. Acesso em: 21 fev. 2023.

KOSELLECK, Reinhart. Uma história dos conceitos: problemas teóricos e práticos. **Estudos Históricos**, Rio de Janeiro, v. 5, n. 10, p. 134-146, 1992.

KOTLER, P.; TRIAS DE BES, F. **Marketing Lateral**: uma abordagem revolucionária para criar oportunidades em mercados saturados. Rio de Janeiro: Elsevier, 2004.

KRUGLIANSKAS, Isak; MATIAS-PEREIRA, José. Um enfoque sobre a Lei de Inovação Tecnológica do Brasil. **Revista de Administração Pública**, Rio de Janeiro, v. 39, n. 5, p. 1011-1029, set./out. 2005.

LONGO, Waldimir Pirró e. **Tecnologia e soberania nacional**. São Paulo: Nobel - PROMOCET, 1984.

LONGO, Waldimir Pirró e. Tecnologia e transferência de tecnologia. **A Defesa Nacional**, v. 65, n. 676, mar./abr. 1978.

LONGO, Waldimir Pirró e; MOREIRA, William de Sousa. Tecnologia e Inovação no setor de defesa: uma perspectiva sistêmica. **Revista Escola de Guerra Naval**, Rio de Janeiro, v. 19, n. 2, p. 277-304, jul./dez. 2013.

LONGO, Waldimir Pirró e; MOREIRA, William de Sousa. O acesso a "tecnologias sensíveis". **Tensões Mundiais**, [S. l.], v. 5, n. 9, p. 73–122, 2018. Disponível em: https://revistas.uece.br/index.php/tensoesmundiais/article/view/669. Acesso em: 1 jul. 2023. DOI: 10.33956/tensoesmundiais.

v5i9.669.

MARINI, Marcos Junior; SILVA, Christian Luiz da. Política de ciência e tecnologia e desenvolvimento nacional: reflexões sobre o plano de ação brasileiro. **Revista Desenvolvimento em Questão**, Ijuí, ano 9, n. 17, p. 9-38, jan./jun. 2011. Disponível em: https://www.revistas.unijui.edu.br/index.php/desenvolvimentoemquestao/article/download/47/6. Acesso em: 04 mar. 2023.

MENEZES, Luciana Ferreira. **Mecanismos e instrumentos estatais de financiamento à inovação tecnológica no Brasil**: um panorama da última década. 2008. 67 f. Monografia (Bacharelado em Ciências Econômicas). Curso de Graduação em Ciências Econômicas. Universidade Federal da Bahia. Salvador, 2008. Disponível em: https://repositorio.ufba.br/bitstream/ri/9485/1/TCC%20LUCIANA%20FERREIRA%20MENEZES.pdf. Acesso: em 02 abr. 2023.

MORAES, Melina Ferracini de. Inovação tecnológica como instrumento para o desenvolvimento do Brasil. **Revista de Direito, Inovação, Propriedade Intelectual e Concorrência**, Brasília, v. 2, n. 1, p. 77-93, jan./jun. 2016. Disponível em: https://www.indexlaw.org/index.php/revistadipic/article/download/922/916. Acesso em: 12 mar. 2023.

MORAES, Isaías Albertin de. Neoindustrialização: uma análise comparativa entre Austrália, Reino Unido e Brasil. **Revista Tempo do Mundo**, n. 36, p. 113-141, 1 dez. 2024.

MOREIRA, William de Sousa. Ciência e tecnologia militar: "política por outros meios?". **Revista da Escola de Guerra Naval**, Rio de Janeiro, v. 18, n. 12, p. 71-90, jul./dez., 2012.

MOREIRA, William de Sousa. **Ciência e poder: o cerceamento tecnológico e as implicações para a defesa nacional**. 2013. 315 f. Tese (Doutorado em Ciência Política). Programa de Pós-Graduação em Ciência Política - Universidade Federal Fluminense, Niterói, 2013.

NEGRI, Fernanda de; CHIARINI, Tulio; KOELLER, Priscila (et al). **Análise da nova "Estratégia Nacional de Inovação"**: inconsistência no diagnóstico,

generalismo dos objetivos, fragmentação de metas, desarticulação com a ciência, timidez e incongruências orçamentárias ameaçam eficácia do plano. Brasília, DF: Ipea, 2021.

NEUFELD, Dorothy. Long waves: the history of innovation cycles. **Visual Capitalist**, 30 jun. 2021. Disponível em: https://www.visualcapitalist.com/the-history-of-innovation-cycles/. Acesso em: 04 nov. 2023.

ORGANIZAÇÃO PARA A COOPERAÇÃO E DESENVOLVIMENTO ECONÔMICO (OCDE). **Manual de Oslo**: diretrizes para coleta e interpretação de dados sobre inovação. Paris: OCDE, 2018.

RIBAS, Lídia Maria. **Inovação Tecnológica**: desafio ao Estado Brasileiro na conquista do Desenvolvimento Nacional. 2023. 91 f. Monografia (Curso de Altos Estudos de Política e Estratégia). Departamento de Estudos da Escola Superior de Guerra - Escola Superior de Guerra (ESG). Rio de Janeiro, 2023.

SANTOS, Antônio; CORRÊA, Claudio Rodrigues. Escenarios futuros: herramientas de prospección de conflictos potenciales en el espacio iberoamericano. In: **Conferencia de directores de los Colégios de Defensa Iberoamericanos** - Posibles factores generadores de conflictos en los próximos años 2025-2040 desde la perspectiva de los Colegios de Defensa Iberoamericanos. Guatemala: COSEDE, 2023, p. 107-141.

SANTOS, Antonio dos. Geopolítica mundial. In: MARCIAL, Elaine C.; PIO, Marcello José (orgs.). **Megatendências mundiais 2040**: contribuição para um debate de longo prazo para o Brasil. Brasília: NEP-UCB, 2023, p. 169-185.

SANTOS, Antonio dos; RIBAS, Lídia Maria. Amazônia, Interesse Nacional e Soberania Brasileira: planejamento, desenvolvimento sustentável e defesa. **Revista Argumentum**, Marília, v. 21, n. 2, p. 627-662, mai./ago. 2020. Disponível em: http://ojs.unimar.br/index.php/revistaargumentum/article/view/1354/799. Acesso em: 02 mai. 2023.

SCHUMPETER, Joseph A. **Capitalismo, socialismo e democracia**. Rio de Janeiro: Editora Fundo de Cultura, 1961.

STEINER, João E.; CASSIM, Marisa Barbar; ROBAZZI, Antonio Carlos. Parques tecnológicos: ambientes de inovação. **Instituto de Estudos Avançados da Universidade de São Paulo**, São Paulo, 2008. Disponível em: http://www.unilago.com.br/download/arquivos/21016/__Steiner_PT_ambientes_inovacao.pdf. Acesso em: 29 abr. 2023.

TIGRE, Paulo Bastos. **Gestão da Inovação**: a economia da tecnologia no Brasil. Rio de Janeiro: Elsevier, 2006.

VIEGAS, Lúcia Helena Tavares. **A expressão científica e tecnológica do poder nacional**: materialidades e virtualidades. 2017. 52 f. Monografia (Curso de Altos Estudos de Política e Estratégia). Departamento de Estudos da Escola Superior de Guerra - Escola Superior de Guerra (ESG). Rio de Janeiro, 2017. Disponível em: https://repositorio.esg.br/bitstream/123456789/1400/1/LÚCIA%20HELENA%20TAVARES%20VIEGAS.pdf. Acesso em: 08 mar. 2023.

VIEGAS, Lúcia Helena Tavares; SANTOS, Jorge Calvario dos. As ações governamentais brasileiras no fomento a Ciência, Tecnologia e Inovação - CT&I estão buscando autonomia tecnológica para o país?. **Revista Brasileira de Estudos Estratégicos**, Niterói, v. 11, n. 21, p. 70-128, 2019. Disponível em: http://www.rest.uff.br/index.php/rest/article/viewFile/176/154. Acesso em: 08 mar. 2023. ISSN: 1984-5642.