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INNOVATION MANAGEMENT BASED ON INTELLECTUAL PROPERTY: STRATEGIES FOR VALUE CREATION AND TECHNOLOGY TRANSFER IN SCIENCE AND TECHNOLOGY INSTITUTIONS

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Abstract

This article discusses the importance of strategic management of Intellectual Property (IP). It aims to highlight the economic and non-economic impacts resulting from the effective integration of IP into innovation management practices. The study adopts a qualitative and exploratory approach based on a narrative and document-based review of scientific literature and institutional sources. The study analyzes how innovation management of intellectual assets, such as patents, software, and trademarks, can generate financial returns through technology transfer agreements, as well as institutional benefits, including the strengthening of the institution's image, which attracts investors and partnerships. It also examines the central role of Technology Innovation Centers (TIC) and the

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main strategies adopted by these structures, such as performance indicators and technology showcases, as mechanisms to support IP management and transfer processes. Finally, it highlights the logic of the triple helix, which integrates the innovation system into a continuous cycle among universities, government, and the productive sector, promoting scientific, economic, and social development and supporting the transformation of knowledge into value. The results suggest that the effectiveness of IP management depends on the integration of institutional, organizational, and operational elements, rather than on protection mechanisms alone.

Keywords: innovation management; intellectual property; technology transfer.

1. Introduction

Technological innovations in recent decades have played a relevant role in promoting economic development in Brazil. In the context of global competition and structural challenges for its implementation, the country has sought to strengthen its innovation ecosystem through normative and operational instruments, such as the Legal Framework for Science, Technology and Innovation (BRASIL, 2016; BRASIL, 2018).

Public policies, legal frameworks, and incentives for applied scientific research have been established. In this setting, Science and Technology Institutions (STI) play a central role, acting as a structural basis for knowledge production and for the development of technological solutions with potential impacts on the productive sector and society (OECD, 2018).

STI perform a strategic function, aiming to transform acquired knowledge into innovation. Through research projects, these institutions account for a significant share of publications and patent applications in the country.

The conversion of knowledge into innovation depends on the effective management of intangible assets, particularly Intellectual Property (IP) (WIPO, 2017).

The legal protection of human intellectual creation is an important tool. When used strategically in innovation management, it can generate value and support social spillovers. These mechanisms, such as patents, software, and trademarks,

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are essential to ensure exclusive exploitation and to facilitate technology transfer agreements. They also contribute to strengthening the institutional reputation of STI.

Despite the advances in public policies and institutional frameworks, there is still a gap between the formal structure of Intellectual Property management and its effective use as a strategic asset within STI. Many institutions still face difficulties in integrating IP management with innovation practices and technology transfer processes.

This study advances the discussion by proposing an integrated analytical perspective that connects institutional policies, IP management practices, and technology transfer mechanisms within STI environments. More specifically, the study seeks to clarify how these elements interact and under which conditions they may contribute to value creation and transfer processes. In this context, it aims to discuss the relevance of strategic management of technological innovation within STI in Brazil, presenting practices from Technology Innovation Centers (TIC) that support the protection and dissemination of these assets.

The goal is to promote an organizational culture that values knowledge and to strengthen mechanisms for technology transfer, in line with the core principles of the innovation virtuous cycle (PADULA et al., 2016). To achieve these objectives, the study adopts a qualitative and exploratory approach, as detailed in the following sections.

2. Literature Review

To support this discussion, the following section presents the main theoretical foundations related to IP and innovation management.

IP has become an essential strategic component in the management of technological innovation, especially within STI. In an environment where knowledge and information are the main assets, IP represents the link between scientific creation and its economic and social application. This process is based on the conversion of knowledge into innovation, in which IP emerges as

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knowledge is transformed into an asset.

IP is the framework that recognizes intangible assets, such as inventions, software, trademarks, and know-how. It represents a formal recognition that enables legal protection and commercial use. In the view of Buainain (2004), it acts as the link between knowledge and the market.

In the Brazilian context, IP is regulated by the Industrial Property Law (Brazil, 1996). However, this law alone does not cover all aspects related to the subject. The legal framework is supported by other specific regulations, such as copyright, plant variety protection, and software laws (Brazil, 1998a; Brazil, 1997; Brazil, 1998b). This indicates that IP operates within a broader and complementary legal system.

WIPO highlights the strategic value of these assets, emphasizing their role in converting intangible resources into economic and social value. In this study, value is understood as a multidimensional concept, including economic value (financial returns), institutional value (reputation and positioning), and social value (public impact and knowledge diffusion). According to WIPO (2017), IP is divided into two main categories: industrial property and copyright.

In Brazil, mechanisms for exploiting intellectual capital were strengthened by the Legal Framework for Science, Technology and Innovation (Law No. 13.243/2016). This framework allows STI to economically exploit intellectual assets through agreements with the productive sector, including technology sharing and revenue distribution. Even when IP assets do not generate significant financial returns, they contribute to the scientific and technological reputation of STI, increasing visibility and presence within the innovation ecosystem.

The Innovation Policy Manual (MCTI, 2018) indicates that structured IP management strengthens investor confidence, fosters organizational culture, and encourages partnerships. This suggests that the effectiveness of IP management depends not only on legal protection, but also on its integration with organizational practices and institutional strategies.

In this context, maintaining a structured and visible portfolio becomes relevant for attracting investors and supporting commercial negotiations. The

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portfolio act as a showcase for the institution, positioning STI within the innovation ecosystem and facilitating interactions with external actors.

This reinforces the importance of adequate protection and organization of technological assets, as these elements support the establishment of technology transfer agreements and strategic partnerships. However, it is important to note that the existence of protected assets does not necessarily guarantee their transfer or commercialization, as this process depends on additional factors such as technological maturity, market alignment, and institutional capacity.

Law No. 10.973/2004 (Innovation Law), later complemented by Law No. 13.243/2016, establishes Technology Innovation Centers (TIC) as central structures for innovation management. These centers perform activities such as portfolio management, evaluation of negotiation opportunities, and interaction with the productive sector, supporting the operationalization of IP strategies within STI.

Through strategic management of IP assets, STI can prioritize projects with greater institutional alignment and economic return potential. This evaluation involves both objective criteria, such as technical feasibility, and subjective aspects related to institutional mission and strategic positioning.

A case study conducted at the Federal University of Mato Grosso highlights the importance of well-defined criteria in portfolio development, especially for projects aimed at technology transfer (Andrade and Oliveira, 2018).

Finally, the literature indicates that the effectiveness of open innovation depends on how IP assets are managed and disseminated. This process enables technological exchanges between universities, companies, and government, reinforcing the systemic nature of innovation (Miranda, 2023). This perspective reinforces the need to understand IP not as an isolated mechanism, but as part of a broader system involving institutional, technological, and market dynamics.

3. Methodology

To address the objectives outlined in this study, the methodology adopted is qualitative and exploratory, based on a narrative and document-based review. It

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was developed from national and institutional scientific literature, including journal articles and technical publications addressing innovation, IP management, science and technology policies, and technology transfer models.

The bibliographic search included databases such as Google Scholar and Scopus, as well as institutional repositories and official websites of organizations related to innovation and intellectual property.

The selection of sources followed predefined criteria, including relevance to the research topic, alignment with the study objectives, and applicability to the Brazilian institutional context. The materials considered were published between 2004 and 2025, covering both regulatory frameworks and applied studies in innovation management. In addition, the analysis included official documents, such as the Legal Framework for STI (Law No. 13.243/2016), the Manual to Support Innovation Policy in STI from the Ministry of Science, Technology and Innovation (MCTI) (MCTI, 2019), and public data from institutional platforms, including INPI, Embrapii, Embrapa, and technology showcase databases.

The purpose of this approach was to integrate these topics in a structured way, supporting a critical analysis focused on identifying practical strategies and opportunities to improve IP management in technological development environments. This approach allows the identification of patterns across different institutional contexts.

The analysis followed an interpretative approach, in which the selected materials were organized into thematic categories, including: (i) institutional and regulatory frameworks, (ii) IP management practices, (iii) technology transfer mechanisms, and (iv) value creation processes. These categories supported the identification of patterns and relationships among the elements discussed.

It is important to note that, as a narrative and document-based review, the study does not aim at statistical generalization, but rather at analytical interpretation based on secondary sources.

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4. Results and Discussion

The Legal Framework for STI (Law No. 13.243/2016) establishes that STI must implement institutional innovation policies aimed at protecting IP, as well as defining guidelines for its management and economic use. The analysis indicates that this regulatory structure provides a formal basis for integrating IP into institutional strategies.

The inclusion of IP protection in STI innovation policies can be understood as a key mechanism for transforming knowledge into economic and social value. This integration allows intangible assets generated by researchers to be protected, ensuring legal security and enabling technology transfer and social spillovers.

However, the analysis suggests that regulatory aspects alone are not sufficient to promote understanding within the organizational culture. Complementary actions such as training, workshops, and institutional guidelines are necessary to consolidate innovation practices (MCTI, 2018). This reinforces that cultural and organizational dimensions play a key role in effective IP management.

In this context, the role of TIC becomes central. These centers provide technical and legal support, assess the feasibility of protection, and mediate negotiations that lead to technology transfer. The analysis indicates that their performance is associated with the effectiveness of IP management in STI, although this relationship depends on institutional conditions.

A systemic approach shows that three elements are critical: (i) evaluation indicators, (ii) incentives for protection, and (iii) institutional culture (Miranda, 2023). These elements provide a basis for understanding how IP management can be operationalized within STI.

From this perspective, performance indicators are essential to support decision-making and investment justification. Quantitative indicators include patents, software registrations, licensing agreements, and royalties, while qualitative indicators include Technology Readiness Level (TRL) and alignment

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with institutional goals (OECD, 2018).

Despite the increase in knowledge production, formal protection processes remain limited. Evidence shows that many innovations are not converted into protected assets, mainly due to cultural barriers and structural limitations in TIC (Lima and Galina, 2015). This suggests that the existence of protected assets does not necessarily guarantee their effective transfer or commercialization. This reinforces that regulatory frameworks must be complemented by active strategies, such as funding programs, internal incentives, and institutional recognition of innovation practices.

In addition to internal mechanisms, external visibility tools also play a relevant role. Technology showcases act as platforms that organize and present intellectual assets, facilitating connections with the productive sector and enabling technology transfer.

The analysis indicates that these platforms increase visibility, support partnerships, and strengthen institutional positioning. Their effectiveness depends on transparency, accessibility, and continuous updating. Examples such as Embrapa and INPI demonstrate that structured platforms improve interaction between academia and industry, reinforcing the practical application of protected technologies (Miranda, 2023).

In this context, the role of IP management extends beyond institutional boundaries and connects with broader innovation systems. Within the triple helix model, universities, government, and industry interact in a dynamic cycle, in which IP acts as a key mechanism for enabling knowledge exchange and technology transfer. The analysis suggests that stronger integration, supported by structured IP management practices, may contribute to greater economic and social impacts.

Based on the elements discussed, particularly the role of TIC, performance indicators, and technology showcases, the analysis indicates that structured IP management supports technology transfer processes. Technology transfer agreements generate financial returns, while collaborative arrangements benefit both public and private sectors. Beyond economic outcomes, these processes may also contribute to social impacts, including job creation, regional

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development, and improvements in public services.

These findings reinforce that the effectiveness of IP management is not limited to protection mechanisms, but depends on its integration with organizational practices and external engagement strategies. The analysis indicates that the Brazilian innovation system still faces structural challenges. However, there are clear opportunities to strengthen IP as a strategic asset through this integrated approach.

Future perspectives include the maturation of TIC, investment in capacity building, and the adoption of broader analytical approaches. Artificial Intelligence (AI) is also expected to improve visibility and efficiency in managing and negotiating intellectual assets.

Overall, the analysis indicates that STI that adopt integrated IP management practices, combining institutional structure, cultural alignment, and operational tools, are more likely to enhance innovation outcomes and strengthen their position within the innovation ecosystem.

5. Conclusion

The central element in the strategic management of innovation within STI is IP, as it plays a key role in valuing scientific knowledge and enabling technology transfer.

The analysis developed in this study highlights that effective IP management depends on the integration of institutional policies, management practices, and organizational culture. In this context, elements such as the role of TIC, the use of technology showcases, and the adoption of performance indicators emerge as relevant mechanisms to support this integration.

When combined, these strategies contribute to increasing the visibility of intellectual assets, attracting investments, and strengthening institutional positioning, while also generating economic benefits and, in some cases, broader social impacts through innovation.

Although the analysis indicates progress in public policies related to IP,

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important challenges remain, particularly in terms of cultural adoption, institutional capacity, and integration with the productive sector. This suggests that advancing IP management requires not only formal structures, but also the alignment of institutional capabilities with external demands.

In this sense, the effectiveness of IP management depends on contextual conditions, including institutional maturity and the ability to connect internal capabilities with external demands.

Overall, the study suggests that STI that adopt integrated and strategic approaches to IP management are more likely to enhance innovation outcomes and consolidate their role within the innovation ecosystem, reinforcing the importance of IP as a central element in innovation management strategies.

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