

FORMICT as a National Source of Indicators for Innovation Policy: challenges and opportunities

FORMICT como Base Nacional de Indicadores para Políticas de Inovação: desafios e oportunidades

Daniel Guedes¹, Adriana Regina Martin¹

¹University of Brasília, Brasília, Federal District, Brazil

Abstract

This study evaluates the potential of the Brazilian Intellectual Property Policy Information Form for Science and Technology Institutions (FORMICT) as a national indicator base for monitoring innovation policies in Science and Technology Institutions (ICTs). The research addresses the risk of underutilization of the instrument for strategic decision-making due to governance issues, data qualification gaps, and delays in report publication. The study combines documentary review, comparative analysis of reports published by the Ministry of Science, Technology and Innovation (MCTI), and surveys with ICTs and related agencies to identify FORMICT uses and limitations. Results show that, although the form consolidates relevant information on intellectual property and technology transfer, its indicators show limited updating and temporal inconsistencies that reduce its usefulness for public managers. The study provides evidence to support methodological improvements, integration with other databases, and strengthen.

Keywords: FORMICT; Indicators; Innovation Policy; Science and Technology Institutions.

Technological Areas: Innovation Management and Intellectual Property. Innovation Policy Indicators.

Resumo

Este estudo avalia o potencial do Formulário para Informações sobre a Política de Propriedade Intelectual das ICTs do Brasil (FORMICT) como base nacional de indicadores para monitorar políticas de inovação das Instituições Científicas e Tecnológicas (ICTs). A pesquisa decorre do risco de baixa utilização do instrumento para orientar decisões estratégicas, devido a problemas de governança, lacunas na qualificação dos dados e atrasos na divulgação dos relatórios. O estudo combina revisão documental, análise comparativa dos relatórios publicados pelo MCTI e levantamento com ICTs e órgãos vinculados para identificar usos e limitações do FORMICT. Os resultados mostram que, embora o formulário consolide informações relevantes sobre propriedade intelectual e transferência de tecnologia, os indicadores apresentam pouca atualização e inconsistências temporais que reduzem sua utilidade para gestores públicos. O estudo oferece evidências para subsidiar aprimoramentos metodológicos, integração com outras bases de dados.

Palavras-chave: FORMICT; Indicadores; Políticas de Inovação; ICTs.



1 Introduction

Innovation plays a central role in economic and social development, driven by the capacity of institutions to generate knowledge, establish technology transfer mechanisms, and guide investments in research and development. Since the work of Schumpeter (1939), who described innovation as a driving force of economic dynamics, studies have highlighted the need for policies capable of reducing market failures and stimulating the production of scientific and technological knowledge (Arrow, 1959; Chaminade; Edquist, 2010). In Brazil, this role falls particularly on Scientific and Technological Institutions (STIs), which have become strategic actors in fostering interactions among universities, government, and the productive sector, while expanding their role in the development of innovation environments (Reghelin et al., 2023).

The effectiveness of these policies, however, depends on the existence of instruments capable of monitoring their implementation and evaluating their outcomes. The literature emphasizes that public decisions can only be effectively guided when based on clear metrics, qualified indicators, and systematic monitoring routines (Bahia, 2021; Moreira; Câmara; Tahim, 2022). Nevertheless, in the field of innovation, challenges remain regarding the consolidation of national databases that enable comparative analyses, bottleneck identification, and the formulation of evidence-based interventions (Cazeiro Astolfi et al., 2023; Varrichio; Rauen, 2020).

In this context, the Form for Information on the Intellectual Property Policy of Brazilian Scientific and Technological Institutions (FORMICT) was established to annually collect information on innovation policies, intellectual property, Technology Innovation Centers (NITs), and technology transfer activities. Despite its legal foundation (Law No. 10,973/2004; Law No. 13,243/2016; and MCTI Ordinance No. 3,859/2020) and its comprehensive scope, studies indicate that the instrument faces challenges related to data quality, indicator standardization, governance of the data collection process, and lengthy intervals between the reference year and the publication of reports (Marchini; Pereira, 2019; Bisneto et al., 2023; Dias et al., 2022).

The identified scientific gap lies in the fact that most studies use FORMICT merely as a data source rather than as the primary object of analysis. Few studies critically examine its potential as a strategic instrument for public innovation policies, its effective capacity to generate reliable indicators, and the perceptions of STIs regarding its role.

Given this context, this study aims to evaluate FORMICT as a national indicator database for monitoring

innovation policies in Brazilian STIs, identifying its strengths, limitations, and opportunities for improvement. To achieve this objective, the study combines documentary analysis of reports published between 2008 and 2024, a review of the literature on innovation policies, and the collection of perceptions from STIs and agencies linked to the Ministry of Science, Technology, and Innovation (MCTI). By providing a systematic analysis of the instrument's challenges, this study seeks to contribute evidence that can support public managers in improving data collection processes, integrating FORMICT with other national databases, and strengthening the governance of innovation policy.

2 Methodology

This study adopts a qualitative approach based on documentary analysis, literature review, and the collection of perceptions from Scientific and Technological Institutions (STIs) and agencies linked to the Ministry of Science, Technology, and Innovation (MCTI). The methodological objective is to examine FORMICT as an instrument for generating indicators to monitor innovation policies, identifying its structure, limitations, and potentialities.

The documentary analysis focused on the public FORMICT reports published by MCTI between 2008 and 2024. The analysis examined the structure of the indicators, the evolution of data collection categories over time, the periodicity and regularity of report publication, changes made to variables, and gaps or inconsistencies identified throughout the historical series.

The analysis followed the documentary research procedures proposed by Cellard (2012), considering context, authorship, credibility, internal coherence, and the contribution of each document to the study's objectives.

The literature review adopted a narrative-analytical approach and focused on three main dimensions: indicators and the monitoring of public policies, particularly in the field of innovation; innovation governance and management within STIs; and previous studies that either used FORMICT data or examined its implementation.

The literature search was conducted using databases such as Web of Science, Scopus, Google Scholar, and SciELO, prioritizing national and international publications from 2010 to 2024. The objective of this stage was not to conduct a systematic review but rather to contextualize FORMICT within the broader debate on indicators, monitoring systems, and innovation policy governance.

To understand how FORMICT is used in practice, a qualitative survey was conducted involving representatives from STIs, including a sample of 12 institutions that use the form, public managers from MCTI-related agencies

involved in data consolidation, and institutional actors engaged in the information collection and analysis process.

The consultations were conducted through an electronic questionnaire designed to identify challenges encountered in completing the form, perceptions regarding the usefulness of the indicators, governance-related difficulties, the potential use of data for decision-making, and suggestions for improvement.

The research sample comprised 12 public STIs from Brazil's Central-West Region, MCTI as the central agency responsible for managing FORMICT data, and five randomly selected agencies from the indirect federal administration linked to MCTI. Responses were analyzed using thematic analysis, following Braun and Clarke (2006), allowing recurring patterns to be organized into analytical categories.

Following these three stages, the data were integrated through qualitative triangulation. This process enabled the comparison of documentary findings with the literature, the assessment of convergence or divergence between the structure of the instrument and its perceived use by managers, and the identification of limitations and opportunities associated with FORMICT as a national indicator database. This integration provides the foundation for the discussions and conclusions presented in this article.

3 Results and Discussion

The results of this study were organized into three analytical dimensions: the structure of the indicators and the characteristics of the database; governance and the data collection process; and the perceptions of STIs, MCTI, and affiliated agencies regarding the use of FORMICT as a monitoring instrument. Based on these dimensions, challenges and opportunities for improving the instrument are discussed, linking the empirical findings with the literature on innovation policies, governance, and indicators.

Accordingly, the bibliographic content analysis examined how the reports completed by STIs, as well as analyses of the instrument itself, have been used by researchers within the context of STIs. Box 1 presents the points of convergence identified among the authors regarding the use of FORMICT, highlighting areas of agreement in the scholarly literature.

Based on the content systematization analysis, it was observed that all ten authors used FORMICT as a source of indicators for analyzing the Innovation Policies of STIs and their respective Technology Innovation Centers (NITs). The second most prominent point of convergence, identified among nine authors, was the use of the instrument to analyze the outcomes of National Innovation Policies. Subsequently, four authors employed the instrument to identify the needs of STIs and their respective NITs.

In fourth position, four additional points of convergence were identified, each mentioned by two authors: the use of FORMICT to consolidate indicators aimed at evaluating the National Innovation Policy; its use as a data source for identifying STIs by region; the recognition of insufficient detail in the information provided; and the need to improve the quality and robustness of the indicators included in the instrument.

Regarding the results of the analysis of reports published by MCTI, Box 2 presents the list of publications examined. Within the consolidated dataset, it is possible to identify the reference year of information related to the Innovation Policies of STIs, the period during which the system was open for STI submissions, and the year in which each report was published.

An analysis of Box 2 shows that, between 2008 and 2010, STIs were given a six-month period to submit responses, and the data were published in the same year in which they were collected. Between 2010 and 2016, the response period for STIs was reduced to four months, while the consolidated reports continued to be published within the same year as data collection. In 2017, despite the collection of data corresponding to the 2016 reference year, no report was published. In 2018, the data for the 2016 reference year were finally released, resulting in a two-year gap between data collection and publication. In 2019, reports covering two reference years were published. Between 2020 and 2022, during the period of social isolation associated with the COVID-19 pandemic, no FORMICT reports were published. In 2023, the report corresponding to the 2019 reference year was released, creating a four-year gap between data collection and publication. In 2024, four FORMICT reports were published, covering the 2020 through 2023 reference years.

Based on the information presented in Box 2, it can be inferred that 2024 was an atypical year due to the publication of four reports, covering the 2020 to 2023 reference years. This demonstrates an effort by the managing agency to reduce the gap between data collection and the dissemination of consolidated information.

The analysis of the published reports identified 18 versions of the document since its first release. In this context, the comparative analysis of reports published between 2008 and 2024 sought to identify similarities and differences in both report structures and indicator frameworks.

Figure 1 presents a comparison and the evolution of FORMICT report structures according to the legal instruments that approved each version of the form, identifying the sections included in each report.

The documentary analysis of FORMICT reports shows that the structure of the indicators has undergone few changes since the instrument was institutionalized.

Box 1 – Points of convergence regarding the use of FORMICT

AUTHOR(S) AND MAIN ARGUMENT – USE OF FORMICT	BISNETO ET AL. (2023)	DIAS ET AL. (2022)	LAVALL, FONTANELA AND MAROCCO (2022)	ALCÁNTARA E ALEN-CAR (2021)	VARRICHIO AND RAUEN (2020)	LEFEVRE E SANTOS (2019)	DA SILVA RIBEIRO, LIMA E ANDRADE (2019)	MARCHINI E PEREIRA (2019)	MARQUES, CAVALCANTI AND SILVA (2018)	MACHADO, SARTORI AND CRUBELLATE (2017)
Indicators of Innovation Policies in STIs and NITs	X	X	X	X	X	X	X	X	X	X
Used for analyzing the outcomes of National Innovation Policies	X	X	X		X	X	X	X	X	X
Identification of the needs of STIs and NITs		X			X		X	X		
Consolidation of indicators for evaluating Innovation Policy					X	X				
Data source for identifying STIs by region	X			X						
Lack of data granularity					X			X		
Need to improve the quality and robustness of FORMICT indicators					X	X				

Source: Prepared by the authors

The indicators remain concentrated in four main groups: innovation policies, Technology Innovation Centers (NITs), intellectual property, and technology transfer. Despite the relevance of these dimensions, limited conceptual updating of the variables was observed, even after the enactment of the Legal Framework for Science, Technology, and Innovation (Law No. 13,243/2016).

Regarding the analysis of responses to the structured questionnaire sent to the research sample, composed of 12 public STIs from Brazil's Central-West Region, MCTI as the central agency responsible for data management, and five agencies from the indirect administration linked to MCTI, it was found that requests for information were submitted to 18 public institutions. Of this total, 12 institutions provided complete responses to the questionnaire, while six institutions did not respond. This corresponds to a valid

response rate of 67% and a non-response rate of 33% within the sample.

Box 3 presents a consolidated summary of the responses to the objective questions (Questions 1 to 4), facilitating comparison among the participating institutions.

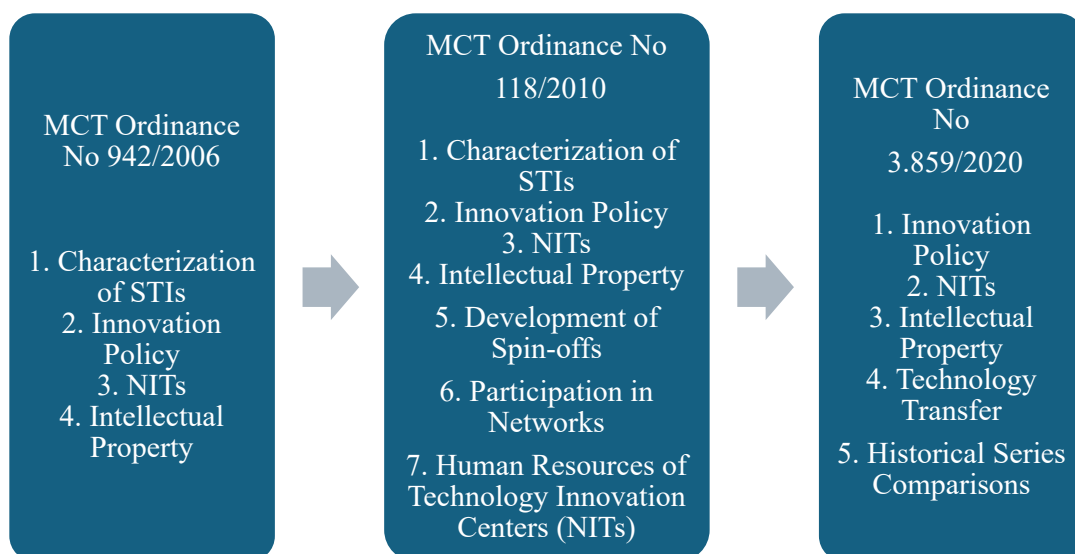
The analysis of responses to Question 1, related to “Awareness and Dissemination,” and Question 2, concerning “Strategic Alignment and Use for Monitoring” within STIs, revealed consistent results. Of the 12 STIs surveyed, nine institutions responded affirmatively, indicating that they are familiar with and disseminate FORMICT, that the instrument is aligned with their institutional strategic objectives, and that it is used to monitor the institution's innovation policy. The remaining three institutions did not provide responses to these questions.

Box 2 – Published FORMICT Reports

REFERENCE YEAR	RESPONSE SUBMISSION PERIOD	PUBLICATION YEAR
2007	Jan/2008 to Jun/2008	2008
2008	Jan/2009 to Jun/2009	2009
2009	Jan/2010 to Jun/2010	2010
2010	Jan/2011 to Jun/2011	2011
2011	Feb/2012 to Apr/2012	2012
2012	Jan/2013 to Apr/2013	2013
2013	Jan/2014 to Apr/2014	2014
2014	Jan/2015 to Apr/2015	2015
2015	Jan/2016 to Apr/2016	2016
2016	Jan/2017 to Apr/2017	2018
2017	Jan/2018 to Apr/2018	2019
2018	Mar/2019 to Jun/2019	2019
2019	Nov/2020 to Mar/2021	2023
2020	Jul/2020 to Aug/2021 and Oct/2021 to Nov/2022	Apr/2024
2021	Feb/2022 to Mar/2022 and Dec/2023 to Jan/2024	Jul/2024
2022	Feb/2023 to Mar/2023 and May/2024 to Jun/2024	Sep/2024
2023	Feb/2024 to Mar/2024 and Aug/2024 to Nov/2024	Sep/2024

Source: Prepared by the authors

Figure 1 – Structure of FORMICT reports according to the regulatory framework



Source: Prepared by the authors

Box 3 – Responses to Questions 1–4 by ICT

ICT	QUESTION 1	QUESTION 2	QUESTION 3	QUESTION 4
UFG	Yes	Yes	Yes	Yes
IFG	Yes	Yes	Não	Yes
UFJ	Yes	Yes	Yes	No
UFCAT	Did Not Respond	Did Not Respond	Did Not Respond	Did Not Respond
UNB	Yes	Yes	Yes	Yes
IFB	Did Not Respond	Did Not Respond	Did Not Respond	Did Not Respond
UFMT	Yes	Yes	Yes	Yes
IFMT	Did Not Respond	Did Not Respond	Did Not Respond	Did Not Respond
UFR	Yes	Yes	Yes	No
UFMS	Yes	Yes	Yes	Yes
IFMS	Yes	Yes	Yes	No
UFGD	Yes	Yes	Yes	No

Source: Prepared by the authors

Regarding Question 3, which addressed the “Evaluation of STI Performance” through the use of the instrument, it was found that eight of the 12 surveyed STIs responded positively. One STI indicated that it does not consider FORMICT an appropriate tool for evaluating institutional performance, while three institutions did not provide a response.

With respect to Question 4, concerning “Decision-Making” within the STI and the use of information from the form in strategic decision-making processes, the greatest divergence among institutions was observed. The results showed that five STIs responded affirmatively, four stated that they do not use FORMICT for strategic decision-making, and three did not respond to the questionnaire. This variation reveals a clear division of opinion regarding the usefulness of the instrument for decision-making purposes.

Questions 5 and 6 were open-ended and allowed respondents to provide subjective and unrestricted comments. Box 4 presents a summarized compilation of the responses to Question 5 regarding the “Challenges of Using FORMICT to Encourage STI Participation in the Innovation Process in Brazil,” organized by STI.

Regarding Question 6, which addressed “Perceptions and Opinions” concerning the use of the instrument as a means of encouraging STI participation in the national innovation process, the comments provided by the institutions are summarized in Box 5, which presents a concise overview of the responses received from the participating STIs.

Box 6 presents the STI responses consolidated by category.

Regarding the temporal gap reported by some STIs, it is important to note that the questionnaire was sent to the institutions for their comments in March 2024. At that time, the most recently published FORMICT report corresponded to the 2019 reference year. However, as previously highlighted, a significant effort was made in 2024 to update the publication schedule, resulting in the release of the reports corresponding to the 2020 through 2023 reference years.

Box 7 presents the response to the questionnaire submitted to MCTI, which provided a single consolidated statement accompanied by the justification for its response.

Regarding the responses from affiliated agencies, it should be noted that, of the five entities included in the research sample, only two responded to the questionnaire. The questionnaire sent to the affiliated agencies consisted of three open-ended questions. First, attention should be given to the response provided by the National Council for Scientific and Technological Development (CNPq), which answered all questions through a single, concise statement, noting that: “FORMICT is a specific initiative of MCTI and is considered to fulfill the purpose established under Article 17 of Law No. 10,973/2004. The institution also recognizes the instrument as an important innovation database for Brazilian STIs.”

The other affiliated institution that provided responses to all three questions, although in a more detailed manner, was the National Nuclear Energy Commission (CNEN). Box 9 presents a summarized version of CNEN’s statement.

Box 4 – Responses to Question 5 by the STIs

ICT	RESPONSE TO QUESTION 5
UFG	Challenge of improving the current model used for presenting results
IFG	The instrument's ability to capture relevant information on the management of Intellectual Property (IP) and Technology Transfer (TT) policies, as well as to transparently reflect the asymmetries and challenges experienced by STIs.
UFJ	Ensuring that data provided by STIs are accurate and consistent; addressing the lack of infrastructure or qualified personnel within STIs; and developing analytical tools that facilitate the use of FORMICT data for strategic decision-making.
UNB	Usability of the system, given that it does not offer a user-friendly interface; and the fact that the information requested by the form often corresponds to indicators already collected by the institution, providing little new information.
UFMT	Professional qualification and career development for STI personnel; as well as the need for additional staff within Technology Innovation Centers (NITs).
UFR	Difficulty accessing information due to the time required for report publication.
UFMS	The gap between the reference year and the publication of the consolidated report; and the static nature of the reports, considering that an online data consultation system would encourage broader use.
IFMS	FORMICT is not intended to stimulate STI participation in the innovation process in Brazil, as it functions solely as a data collection instrument provided by MCTI. To improve IP and TT management through FORMICT, it should be integrated with other government systems that pursue similar objectives.
UFGD	The need for specialized personnel dedicated to NIT activities, as there is currently no specific career position designed for work within Technology Innovation Centers

Source: Prepared by the authors

Box 5 – Responses to Question 6 by the STIs

ICT	RESPONSE TO QUESTION 6
UFG	FORMICT serves as an important reference instrument; however, there is a need to improve the quality of its indicators in order to prevent the submission of unconsolidated or overly aggregated information.
IFG	FORMICT has the potential to encourage the participation of STIs in the national innovation process.
UFJ	FORMICT has the potential to transform Brazil's innovation landscape by providing a robust information base for decision-making. However, to maximize its impact, continuous efforts from all stakeholders are required to overcome operational and strategic challenges. We believe that, through improvements in data collection procedures, greater integration of information into institutional policies, and stronger collaboration among STIs, FORMICT can become an even more powerful tool for fostering innovation and technological development in Brazil. One possible solution would be the adoption of standardized reporting procedures and the provision of regular training programs for STIs
UFR	The existence of a form capable of collecting intellectual property (IP) data from across the country and making these data available, after compilation, in the form of reports is highly valuable for facilitating access to information and fostering connections among STIs nationwide. However, largely due to the workload associated with processing and consolidating the data, the time lag between data collection (reference year) and data availability has become a significant bottleneck, limiting the instrument's broader usefulness and impact.
IFMS	FORMICT plays an important role as a data collection tool for monitoring intellectual property (IP) and technology transfer (TT) activities within Brazilian STIs. Although it is not specifically designed to encourage STI participation in the innovation process, it provides a robust information base that can be used to assess the national innovation landscape. To effectively stimulate STI engagement in innovation activities, FORMICT would need to be complemented by policies and programs that promote university-industry collaboration, research and development funding, and the effective protection and commercialization of technologies. Furthermore, integrating FORMICT with other government information systems could enhance its usefulness as a strategic instrument for fostering innovation and technological development in Brazil

Source: Prepared by the authors

Box 6 – Subjective responses from STIs: positive and negative aspects

POSITIVE ASPECTS	NEGATIVE ASPECTS
<ul style="list-style-type: none"> Identifies FORMICT as a tool for understanding the landscape of STIs and their Intellectual Property (IP) and Technology Transfer (TT) activities, supporting the formulation of innovation policies. Highlights the importance of FORMICT in consolidating information on STI IP and TT activities and serving as a reference tool for monitoring purposes. Recognizes FORMICT as an important database for innovation activities within STIs. Uses FORMICT information to support decision-making and strategic planning processes. Considers that FORMICT provides a foundation for monitoring and evaluating IP and TT activities, enabling adjustments to institutional strategies. Uses FORMICT information to guide resource allocation decisions. 	<ul style="list-style-type: none"> Need to improve the system interface and the accessibility of reports The time lag between data collection and report publication is identified as a significant challenge (temporal gap). Need to improve the quality and depth of the indicators to prevent the inclusion of unconsolidated information. Need for greater qualification and training of NIT personnel to better understand and complete FORMICT. FORMICT information is not always accessible or easily understandable to all stakeholders. Highlights challenges related to STI engagement and institutional participation in completing FORMICT.

Source: Prepared by the authors

Box 7 – Responses to the Questionnaire by MCTI

TOPIC: USE OF THE FORMICT REPORT BY MCTI POLICY DEPARTMENTS
<p>MCTI Response: SETEC has within its organizational structure the Intellectual Property and Technology Transfer Coordination (COPIT), whose role is to evaluate the annual information on intellectual property and technology transfer submitted by Science, Technology, and Innovation Institutions (STIs), with particular emphasis on Technology Innovation Centers (NITs), in accordance with the applicable legislation. In addition, this Coordination is responsible for preparing and publishing the annual report on the Intellectual Property Policy of Brazil's Science, Technology, and Innovation Institutions. For this purpose, the FORMICT Report is used as a tool to understand the landscape of STIs and their Intellectual Property (IP) and Technology Transfer (TT) activities. The consolidated data provided by STIs enable a comprehensive analysis that supports the development and improvement of innovation policies in Brazil.</p>
<p>Topic: Alignment of FORMICT with MCTI's strategic objectives</p>
<p>MCTI Response: SETEC considers FORMICT to be an important tool for the evaluation and implementation of Brazil's Legal Framework for Science, Technology, and Innovation (ST&I). As such, it not only provides a comprehensive overview of Intellectual Property (IP) and Technology Transfer (TT) policies, but also serves as a valuable instrument for monitoring and evaluating the progress of these policies over time.</p>
<p>Topic: Use of FORMICT for the performance evaluation of STIs</p>
<p>MCTI Response: The information provided through FORMICT enables the contextualization of the implementation of innovation policies within Brazilian STIs, while also supporting analysis and discussion regarding the role of Technology Innovation Centers (NITs) in universities. These data provide valuable insights into the national innovation landscape, helping to guide resource allocation and the development of more effective public policies.</p>
<p>Topic: Main Challenges in Using FORMICT to Encourage STI Participation and Improve the Management of IP and TT Policies.</p>
<p>MCTI Response: One of the main challenges in using FORMICT to encourage STI participation lies in ensuring broader and more effective engagement from these institutions. This requires overcoming barriers such as limited awareness of the importance of FORMICT, as well as simplifying the processes for completing and submitting information. Furthermore, it is essential to promote continuous collaboration and engagement among both public and private STIs in order to strengthen the database and make FORMICT an even more robust instrument for monitoring and improving innovation policies in Brazil.</p>
<p>Topic: Perceptions and opinions regarding FORMICT</p>

MCTI Response: FORMICT is an important tool for promoting innovation within the country’s Scientific and Technological Institutions (STIs). Its use enables a detailed analysis of the intellectual property and technology transfer landscape, providing valuable evidence to support the development of more effective policies and the promotion of Brazil’s socioeconomic development. In summary, FORMICT is used to monitor and manage MCTI’s innovation policies, providing valuable data that guide the Ministry’s actions and decision-making processes.

Source: Prepared by the authors

Box 8 – CNEN responses to the questionnaire

TOPIC: AWARENESS AND DISSEMINATION OF FORMICT

CNEN Response: FORMICT reports are publicly available on MCTI’s website. These reports identify the National Nuclear Energy Commission (CNEN) as one of the STIs that submits information through FORMICT. CNEN has been completing the FORMICT form since 2012.

With regard to the dissemination of FORMICT information, Decree No. 9,283/2018, which regulates the Innovation Law, establishes in Article 17, Paragraph 2, that public STIs must publish on their official websites the information submitted to MCTI in the form of open data, except for information classified as confidential. To date, CNEN has not made such information publicly available, due to the need to distinguish between information that may be disclosed and information that must remain confidential, particularly new patent applications and innovation-related agreements (technology contracts) established with companies

Topic: Alignment of FORMICT with science and technology strategy and its role in encouraging STIs

CNEN Response: FORMICT merely presents the results of the implementation of the Innovation Law by Brazilian STIs, both public and private institutions that receive public funding. It is not, in itself, a public science and technology (S&T) or industrial policy instrument. However, the information it generates is highly relevant for studies aimed at improving the understanding of the strategic direction of innovation in Brazil, given that most research and development (R&D) activities in the country are conducted within Brazilian STIs, particularly public institutions.

In addition, the information collected through FORMICT is valuable for identifying key characteristics of STI-industry interactions in Brazil, including the role of actors within innovation systems (national, regional, and sectoral), the content of these interactions (such as the nature of the knowledge being transferred or exchanged), and the dynamics of these relationships. The data also provide insights into the main fields and sectors served, the innovation instruments most frequently used by STIs, and other relevant aspects that, when analyzed collectively, can generate important implications for public policy formulation

Topic: Perceptions and Opinions Regarding FORMICT

CNEN Response: As stated in Item 2, the information provided through FORMICT is considered relevant. However, the opinion expressed is that certain concepts related to STI-industry interactions and the innovation process should be reassessed, and that the system’s interface with end users should be improved

Source: Prepared by the authors

The findings of this study reveal governance challenges in the way FORMICT is operationalized. Annual data collection depends heavily on the ability of each STI to systematize its own internal information, resulting in significant variations in the quality of the data submitted. STIs with well-structured teams tend to provide more consistent information, whereas institutions with more limited technical capacity face greater difficulties in completing the form.

This pattern is consistent with the diagnoses presented by Marchini and Pereira (2019) and Bisneto et al. (2023), who identify institutional asymmetries as one of the main obstacles to the development of national innovation indicators. In the specific case of FORMICT, the surveyed STIs reported three central challenges: the lack of internal standardization in data collection, particularly regarding

the registration of contracts and partnerships; the absence of detailed interpretative guidelines, leading to different understandings of categories such as “technology transfer,” “spin-off creation,” or “software protection”; and the complexity of data consolidation, which requires dedicated human resources.

Another issue identified is the limited feedback provided throughout the process. STIs submit information annually but receive little institutional feedback regarding inconsistencies, performance patterns, or benchmarking comparisons that could support continuous improvement. The governance literature emphasizes that monitoring systems only promote meaningful change when they incorporate continuous cycles of result utilization and feedback (Moreira; Câmara; Tahim, 2022).

4 Final Considerations

This study evaluated FORMICT as a national indicator database for monitoring innovation policies within Brazil's Scientific and Technological Institutions (STIs), examining its structure, governance, and the perceptions of stakeholders involved in the collection and use of information. The results show that, although the instrument consolidates relevant data on innovation policies, intellectual property, and technology transfer, its capacity to support strategic decision-making remains constrained by operational and structural challenges.

The documentary analysis revealed that the indicators have undergone limited conceptual updating over the years, restricting their ability to capture contemporary dynamics of innovation practices. Irregularities in the publication of reports compromise the continuity of the historical series, affecting comparative analyses and reducing the usefulness of the instrument for institutional planning. The governance assessment identified significant asymmetries in the ability of STIs to systematize and report data, as well as weaknesses in the processes of data validation and standardization.

The perceptions collected from STIs, MCTI, and affiliated agencies indicate that FORMICT is used predominantly as a legal compliance mechanism rather than as a strategic management tool. The absence of analytical feedback, dashboards, and data visualization instruments reduces its potential to support institutional learning and limits the appropriation of indicators for managerial purposes.

As a practical contribution, this study provides a set of evidence-based findings that may guide improvements to FORMICT, particularly regarding indicator updating, governance strengthening, the development of feedback mechanisms, and the integration of the instrument with other national Science, Technology, and Innovation (ST&I) databases. The consolidation of such an integrated structure may enhance the capacity of the Brazilian State to monitor innovation policies more accurately and support evidence-based decision-making processes.

As a limitation, it should be acknowledged that the qualitative survey did not encompass all STIs in the country and that the documentary analysis was restricted to published reports. Future research may further explore comparative assessments among national innovation databases, investigate the impact of STI internal governance on the quality of reported data, and examine international monitoring system models that could provide insights for the improvement of FORMICT.

5 Future Perspectives

The findings of this study indicate that FORMICT has the potential to evolve from a mandatory data collection instrument into a national indicator database capable of guiding innovation policies in Brazil. To achieve this transformation, several avenues for future improvement can be identified.

First, there is a clear need for the periodic updating of the indicator framework, incorporating variables that reflect contemporary STI practices, such as new technology transfer arrangements, hybrid partnership models, and co-innovation mechanisms. Such conceptual modernization would enhance the analytical capacity of the database and reduce the gap between the instrument and the current regulatory framework.

Another promising direction involves strengthening the governance of the data collection process through the establishment of formal procedures, transparent data validation criteria, and standardized interpretative guidance. The development of operational manuals, continuous training programs, and verification mechanisms could significantly improve the quality of the information submitted by STIs.

A third perspective concerns the systemic integration of FORMICT with other national databases, such as PINTEC, the National Institute of Industrial Property (INPI), and government Science, Technology, and Innovation (ST&I) registries. Such integration could reduce duplication of effort, improve data consistency, and support broader analyses of the Brazilian National Innovation System.

An additional opportunity lies in the development of data visualization and analytical feedback tools for STIs, including dashboards, benchmarking reports, and alert systems. These instruments could enhance the strategic use of indicators by institutions, transforming annual data collection into a continuous cycle of learning and improvement.

Finally, future studies should examine the impact of STI institutional capacity on the quality of submitted data, investigate international models for monitoring innovation policies, and explore data science approaches applicable to the consolidation and analysis of national indicators. Such research may contribute to the methodological enhancement of FORMICT and support its consolidation as a strategic instrument of public governance.

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About the Authors

Daniel Guedes

E-mail: danieldf100@gmail.com

ORCID: <https://orcid.org/0009-0000-2336-7268>

Master's Degree in Intellectual Property and Technology Transfer for Innovation, PROFNIT, University of Brasília, 2025.

Professional Address: University of Brasília (UnB), Darcy Ribeiro University Campus, Asa Norte, Brasília, Federal District, Brazil. ZIP Code: 70904-970..

Adriana Regina Martin

E-mail: drimartin88@gmail.com

ORCID: <https://orcid.org/0000-0003-4585-6630>

Ph.D. in Materials Science and Engineering, Federal University of São Carlos, 2001.

Professional Address: University of Brasília (UnB), Darcy Ribeiro University Campus, Asa Norte, Brasília, Federal District, Brazil. ZIP Code: 70904-970.