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BrCris as a socio-technical infrastructure for innovation in scientific information management

Abstract
Brazilian scientific production is characterized by a wide diversity of research outputs, which poses significant challenges for the integration, organization, and analysis of scientific information at a national scale. In this context, the Brazilian Current Research Information System (BrCris), developed by the Brazilian Institute of Information in Science and Technology (Ibict), emerges as a strategic socio-technical infrastructure for managing and disseminating data on science, technology, and innovation in Brazil. This study analyzes the BrCris platform through the innovation framework proposed by Bessant and Tidd (2009), which conceptualizes innovation across the dimensions of product, process, positioning, and paradigm. Adopting a qualitative approach based on systematic document analysis of institutional publications, technical documentation, scientific literature, and publicly available platform features, the research identifies empirical and conceptual evidence of innovation embedded in BrCris's architecture and functionalities. The findings indicate that BrCris promotes product innovations through interactive dashboards and analytical reports, process innovations through large-scale data integration, standardization, and disambiguation mechanisms, positioning innovations by aligning Brazilian scientific production with international open science infrastructures, and paradigmatic innovations by fostering institutional and cultural shifts toward transparency, data certification, and informational justice. The study concludes that BrCris operates not only as an information system but also as a vector of institutional and epistemic transformation, reinforcing its strategic role in advancing Open Science and scientific governance in Brazil.

Keywords

Scientific Information Infrastructure, BrCris, Innovation Dimensions, Open Science.

Introduction

Scientific information systems have become central to the organization, evaluation, and governance of contemporary research ecosystems, particularly in contexts marked by the diversification of research outputs and the growing demand for transparency and interoperability. As scientific production increasingly extends beyond traditional journal articles to include datasets, software, patents, and other non-traditional outputs, national research systems face substantial challenges in integrating, standardizing, and making visible this heterogeneous body of knowledge. Within this scenario, Current Research Information Systems (CRIS) play a strategic role by enabling the structured aggregation, certification, and analysis of scientific information, thereby supporting evidence-based decision-making, research evaluation, and the advancement of Open Science practices.

Brazilian scientific production is highly diverse, encompassing multiple fields of knowledge and forms of scholarly output. In addition to articles published in indexed journals, theses and dissertations, books, chapters, software, patents, and research datasets are common. This plurality, while enriching, also poses significant challenges to the collection, integration, organization, and analysis of this data, especially when the goal is to generate consistent and comparable indicators in the field of Science, Technology, and Innovation (ST&I).

In Brazil, the BrCris Platform, developed by the Brazilian Institute of Information in Science and Technology (Ibict), constitutes a strategic initiative in this field. Inspired by international models such as PTCris

(Portugal) and LA Referencia (Latin America), the BrCris Platform integrates data from various national and international sources, such as data available on the Lattes Platform, Sucupira, Oasisbr, BDTD, Espacenet, Crossref, DOAJ, among others, with the aim of organizing, certifying, visualizing, and disseminating data on scientific and technological activity in the country (Silva et al., 2023; Pinto et al., 2022).

The BrCris structure is anchored in international standards of interoperability and semantic modeling, such as the use of the VIVO ontology and the CERIF metamodel, allowing for the qualified reuse of scientific information and the generation of auditable metrics (Dias et al., 2023). Furthermore, its ability to export data in open and reusable formats, coupled with the customization of dashboards and filters, has broadened its contribution to Open Science in Brazil (Dias; Segundo; Souza, 2025).

Against this backdrop, the following research question guides this study: how do the dimensions of innovation proposed by Bessant and Tidd (2009) manifest themselves in the BrCris Platform, and what limits and potentialities can be observed in its configuration as a socio-technical infrastructure of Brazilian science?

Development

The methodological approach of this work is based on the theoretical analysis of the model proposed by Bessant and Tidd (2009), which classifies innovation into four complementary dimensions: product, process, positioning, and paradigm. This framework was selected because it offers a consolidated analytical structure for identifying innovative practices in organizational and technological environments, such as public information systems.

The data collection phase was conducted through a systematic document review, focusing on primary and secondary sources related to the BrCris Platform. Institutional documents from the Brazilian Institute of Information in Science and Technology (Ibict), scientific and technical dissemination materials, technical reports, institutional presentations, and scientific articles that describe or analyze the structure, objectives, functionalities, and impacts of the platform on the national science, technology, and innovation ecosystem were examined. In addition, metadata and interactive resources available on the official BrCris portal were considered, complementing the understanding of the technical operation of the infrastructure.

The analytical process consisted of identifying, based on the analyzed documents, empirical and conceptual evidence that demonstrated the presence of the four dimensions of innovation in the context of the BrCris Platform. To this end, a summary table was developed relating each dimension to the functionalities, institutional objectives, and technological processes operated by BrCris. This systematization made it possible to highlight the elements that characterize the system as an innovative artifact, with socio-technical mediations that reconfigure informational practices in Brazil.

Thus, the results were interpreted in light of theoretical contributions on innovation in scientific information infrastructures, technological mediation, and socio-technical systems, with an emphasis on the role of these infrastructures in promoting Open Science, informational justice, and supporting public policies oriented towards sustainable scientific development.

The analytical examination of the BrCris Platform through the innovation framework proposed by Bessant and Tidd (2009) demonstrates that the identified innovations are neither isolated nor linear, but rather interdependent and mutually reinforcing across product, process, positioning, and paradigm dimensions. The integration of heterogeneous data sources, the adoption of international interoperability standards, and the provision of analytical and visualization tools collectively reveal how technological, organizational, and cultural elements converge within BrCris to reconfigure scientific information practices in Brazil. This multidimensional perspective highlights the platform's capacity to operate simultaneously as an information infrastructure, a governance mechanism, and an agent of socio-technical transformation, setting the stage for broader reflections on its systemic impacts and long-term implications.

Results

The analysis of the innovation dimensions evidenced in the BrCris Platform demonstrates that this information system operates as a socio-technical artifact deeply aligned with the Open Science agenda and the needs for reorganizing scientific information flows in Brazil. In light of the model proposed by Bessant and Tidd (2009), BrCris presents concrete expressions of the four analytical dimensions: product, process, positioning, and paradigm.

In the product dimension, BrCris offers innovative resources such as interactive dashboards, thematic reports, institutional profiles, and structured data exports for bibliometric and scientometric analysis. These informational products represent a transformation in the way scientific information is made available, interpreted, and used in the context of public science management. The literature on scientific information systems highlights that the generation of visually accessible, interoperable, and analysis-oriented informational products is a key component for strengthening institutional capacities in open science and innovation (Gabriel Junior et al., 2020; Pinto et al., 2022). Furthermore, the products developed by the platform align with the facets of "data visualization," "science assessment," and "scientific communication" present in the Open Science taxonomy (Silveira et al., 2023), demonstrating BrCris's commitment to transparency, accessibility, and the valorization of public knowledge.

The process dimension is evidenced by the complex and robust integration of data from different institutional sources, through disambiguation tools, deduplication, the use of controlled vocabularies, interoperable metadata, and technologies such as the VIVO ontology. This is a process innovation by technically reconfiguring the way scientific data circulates, connects, and is managed. As Bessant and Tidd (2009) point out, process innovation is directly related to efficiency and the reformulation of productive methods. In this sense, BrCris consolidates previously dispersed practices into a unified information flow, promoting standardization, traceability, and technical alignment with the requirements of Open Science, as discussed by Pinto et al. (2022) and Silva et al. (2023).

The positioning dimension refers to how BrCris contributes to repositioning Brazil in the international landscape of scientific information governance. The articulation with the OpenAIRE infrastructure, the adoption of international interoperability standards, and alignment with the FAIR principles make BrCris a strategic link between national scientific production and the major global research data ecosystems. This reconfiguration of positioning, as discussed by Dias et al. (2025), demonstrates an institutional effort to integrate into global Open Science, promoting openness, transparency, and transnational collaboration in the production and use of scientific information.

Finally, the paradigm dimension is evident in the cultural and institutional transformation promoted by the platform. By inducing data certification practices, author disambiguation, transparency, and standardization, BrCris contributes to a profound change in the mental and organizational model of scientific information management in Brazil. This paradigmatic innovation, according to Bessant and Tidd (2009), is the most disruptive among the dimensions, as it implies the revision of consolidated assumptions, values, and modes of operation. Dias et al. (2023) highlight that the implementation of BrCris involves data standardization, the adoption of interoperable semantic structures, and the integration of multiple institutional sources, configuring a structural transformation in the ways of organizing, processing, and using scientific information in Brazil.

Thus, the results of the dimensional analysis demonstrate that BrCris not only fulfills its role as an informational infrastructure, but also acts as a vector of institutional and epistemic innovation, aligned with the UNESCO guidelines (2022), the principles of informational justice (Johnson, 2014; Smith, 2001), and the Open Science taxonomy proposed by Silveira et al. (2023). This evidence is systematized in Table 1, which relates each dimension of the Bessant and Tidd model (2009) to the concrete manifestations observed in the BrCris Platform.

Table 1 – Innovation dimensions of the BrCris Platform based on Bessant and Tidd (2009)

Item	Innovations at BrCris	Product	Process	Positioning	Paradigm

1	Interactive dashboards with thematic and visual filters.	**X**			
2	Dynamic science, technology and innovation (ST&I) reports.	**X**	**X**		
3	Integration of institutional databases with interoperable metadata.		**X**		**X**
4	Linking authors, projects, products, and funding.	**X**	**X**		
5	Redesigning the governance of scientific information.				**X**
6	Brazil's integration into global open science networks.			**X**	
7	Public interface focused on accessibility and transparency.	**X**	**X**	**X**	
8	Georeferenced mapping of scientific production.	**X**	**X**	**X**	
9	Unique identification of researchers, projects, and institutions.	**X**	**X**		
10	Certification of national scientific data.		**X**	**X**	**X**
11	Adoption of international interoperability standards (e.g., CERIF, ORCID, DOI).		**X**		**X**
12	Automated generation of institutional reports for science and technology management.	**X**	**X**		
13	Connecting to open science directories and platforms (e.g., La Referencia, OpenAIRE).		**X**	**X**	
14	Unified data model for representing scientific information.		**X**		**X**
15	National and international visibility of Brazilian scientific production.			**X**	

*Note: An "**X**" indicates a direct and empirically supported association between the innovation dimension and the corresponding BrCris feature.*

The analysis of the systematized items allows us to identify how the innovation promoted by BrCris is multifaceted. Items such as interactive dashboards, reports, and the export of structured data (1, 2, 12) reinforce the product dimension, creating new informational objects that enhance scientific communication. The integration of institutional databases, the use of international standards, and data certification (3, 10, 11, 14) highlight advances in process, signaling greater efficiency and traceability. In terms of positioning, initiatives such as Brazil's inclusion in global open science networks and the international visibility of national scientific production are evident (6, 13, 15).

Finally, the paradigm dimension manifests itself in structural changes such as the redesign of scientific information governance and the induction of standardization and disambiguation practices (5, 10), which transform consolidated assumptions about information management. This intersection shows that many innovations are not isolated, but interdependent, reinforcing the understanding of BrCris as a vector for broad reconfiguration of the national scientific information infrastructure.

It is observed that most of the innovations identified in the BrCris Platform have a transversal character, articulating more than one dimension of the Bessant and Tidd (2009) model, while others focus on specific aspects of product, process, positioning, or paradigm. Subsequently, the final considerations revisit these findings, highlighting the structural impacts of innovations on the Brazilian science information ecosystem. This differentiation highlights the complexity and scope of the transformations promoted by the platform, reinforcing its strategic role in the articulation between technology, public policies, and scientific information management. In this way, paths for future research and institutional applications aimed at strengthening scientific governance and Open Science are indicated.

In addition to the examples systematized in Table 1, it is possible to observe additional evidence that reinforces the fulfillment of the four dimensions of innovation. In terms of product, the adoption of persistent identifiers (DOI, ORCID) and the possibility of exporting in open formats enhance reusability and integration with external tools such as VOSviewer and Gephi.

In terms of process, the advancements in deduplication and disambiguation algorithms stand out, continuously being improved to ensure greater accuracy in linking authors, institutions, and publications. Regarding positioning, BrCris's inclusion in international networks such as La Referencia and OpenAIRE demonstrates its capacity to increase Brazil's representation in a global Open Science ecosystem, promoting greater international visibility of national scientific production. Finally, in the paradigmatic dimension, the platform promotes a cultural shift by inducing scientific information governance practices based on data certification and auditability, in line with UNESCO principles and the notion of informational justice.

Considerations

The analysis of the innovation dimensions evidenced in the BrCris Platform allowed us to understand its configuration as a socio-technical information system oriented towards the transformation of information flows and practices in the Brazilian scientific context. Based on the model of Bessant and Tidd (2009), the investigation revealed that BrCris incorporates innovative elements that are expressed in its functionalities, operational processes, strategic alignments, and paradigmatic transformations.

In the field of positioning, BrCris repositions Brazil on the international stage by adhering to infrastructures such as OpenAIRE and incorporating principles of Open Science and FAIR data. In the paradigmatic dimension, a structural change is observed in the culture of scientific information management, with the emphasis on participatory governance, certification, disambiguation, and standardization as pillars of reliability, transparency, and informational justice.

In conclusion, the analysis of the innovation dimensions embodied in the BrCris Platform underscores its significance as a strategic socio-technical infrastructure for the organization and governance of scientific information in Brazil. By articulating technological integration, institutional coordination, and cultural change, BrCris contributes not only to improving the efficiency and transparency of scientific information management, but also to fostering structural transformations aligned with Open Science principles and informational justice. These findings suggest that BrCris represents a relevant model for other national research information systems seeking to balance data integration, innovation, and governance, while also opening avenues for future research on the impacts of CRIS infrastructures on scientific policy, evaluation practices, and knowledge production in diverse national contexts.

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