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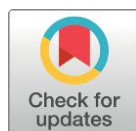**RDBCI|**
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Librarians, Scientific Publishing and Open Science: Competencies and challenges in an evolving ecosystem

Nancy Sánchez Tarragó [1] iD   Taliane de Assis Oliveira [2] iD

ABSTRACT

Introduction: Digitization and open science movements have significantly transformed editorial processes and outputs, requiring new competencies—knowledge, skills, and attitudes—from all professionals involved in scholarly publishing, including librarians. Objective: To map the competencies required and the challenges faced by librarians in the open science ecosystem, with emphasis on activities related to journal publishing.
Methodology: The study combined a narrative literature review with interviews conducted with editors of Brazilian scholarly journals in Library and Information Science and related fields. Results: The most relevant competencies for librarians working in scholarly publishing include data management, scientific publishing, the use of traditional and alternative metrics, and the promotion of research integrity. The literature highlights the integration between journals, preprints, repositories, and open peer review systems, as well as the need for responsible use of metrics. Empirical data confirmed that practices such as open peer review, preprints, and open data still face resistance, lack of familiarity, and implementation difficulties in the LIS editorial field. Conclusion: The challenges faced by librarian editors span technical, educational, institutional, and financial dimensions, requiring the development of specific competencies. The ability to "learn how to learn" emerges as essential in keeping pace with ongoing technological and normative changes. Strengthening professional training, institutional support, and ethical editorial practices are fundamental to consolidating the strategic role of librarians in promoting open, inclusive, and socially engaged science.

KEYWORDS

Librarians. Scientific journals. Scholarly publishing. Professional competencies. Open science.

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Bibliotecários, publicação científica e ciência aberta: competências e desafios em um ecossistema em transformação

RESUMO

Introdução: A digitalização e os movimentos de abertura ao conhecimento científico têm provocado transformações significativas nos processos editoriais, exigindo novas competências dos profissionais envolvidos na publicação científica, incluindo os bibliotecários. Objetivo: Mapear as competências requeridas e os desafios enfrentados por bibliotecários no ecossistema da ciência aberta, com ênfase nas atividades editoriais. Metodologia: A pesquisa combinou uma revisão narrativa de literatura com entrevistas realizadas com editores de periódicos científicos brasileiros das áreas de Biblioteconomia, Ciência

Author's correspondence

[1] ROR Universidade Federal do Rio Grande do Norte
Natal, RN - Brazil
nancy.sanchez@ufrn.br

[2] Instituto de Ensino, Pesquisa e Inovação da Liga Norte Riograndense Contra o Câncer
Natal, RN - Brazil
taliane.assis@hotmail.com

da Informação e afins. Resultados: As competências mais relevantes para bibliotecários atuantes na editoração científica incluem: gestão de dados, publicação científica, uso de métricas tradicionais e alternativas, e promoção da integridade da pesquisa. A literatura evidencia a articulação entre periódicos, preprints, repositórios e avaliação aberta, além da necessidade de domínio de métricas responsáveis. Os dados empíricos confirmaram que práticas como avaliação aberta, preprints e dados abertos ainda enfrentam resistências, desconhecimento e dificuldades operacionais. Conclusão: Os desafios enfrentados envolvem aspectos técnicos, formativos, institucionais e financeiros, exigindo o desenvolvimento de competências específicas. Destaca-se a importância da competência de "aprender a aprender", essencial diante das constantes transformações do ecossistema científico. O fortalecimento da formação profissional, a valorização institucional e o compromisso ético com a comunicação científica são fundamentais para consolidar o papel estratégico do bibliotecário na promoção de uma ciência aberta, inclusiva e socialmente comprometida.

PALAVRAS-CHAVE
Bibliotecários. Periódicos científicos. Editoração científica. Competências profissionais. Ciência aberta.

CRediT

JITA: JL. Digital curator
ODS: 4. Quality education

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1 INTRODUCTION

Since their inception in the 17th century, scientific journals have served key functions, including communicating knowledge, establishing intellectual priority, and maintaining quality standards. With the advent of digitization and open access movements, these journals have undergone profound transformations that have affected their editorial processes and the professionals involved.

Abadal (2020) identifies three main milestones in this trajectory: (1) digitization in the 1990s, which expanded the reach and functionality of publications; (2) the open access movement that consolidated in the 2000s and promoted the free dissemination of knowledge; and (3) open science initiatives that started in 2015 and propose changes in all stages of the research cycle with practices based on transparency, collaboration, and equity (Silveira et al., 2023).

These changes require new skills, knowledge, abilities, and attitudes from everyone involved in scientific publishing, especially editors. Editors coordinate processes, bring together different stakeholders, and incorporate innovations (Sánchez-Tarragó, 2022). Among professionals qualified to work in this field, librarians stand out because their technical mastery of information flow, as well as their ethical and social skills, contributes significantly to editorial quality.

Although studies have examined the role of librarians in scientific publishing (Farias, Lima, & Santos, 2018; Santa Anna, 2019; Santana & Francelin, 2016) and open science (Ligue des Bibliothèques Européennes de Recherche, 2020; Ribeiro, Oliveira, & Diniz, 2024), little research has addressed these professionals' skills in the context of open science publishing.

This study aims to address this gap by identifying the necessary skills and challenges that librarians encounter in scientific journal publishing within the open science ecosystem. To this end, a narrative literature review was conducted, and interviews were held with Brazilian journal editors specializing in Library Science, Information Science, and related fields.

The article is organized as follows: Section 2 explores open science initiatives and their relationship with scientific publishing. Section 3 discusses librarians' professional skills in scientific publishing and open science. Section 4 presents the methodological procedures. Section 5 discusses the results of the review and interviews. Finally, Section 6 presents the conclusion.

2 THE OPEN SCIENCE ECOSYSTEM AND SCIENTIFIC PUBLICATION

The publication of scientific articles involves an editorial flow composed of technical processes and scientific decisions, operated by professionals with different skills. According to Sandes-Guimarães and Diniz (2014), this flow encompasses two main areas: the scientific area, responsible for evaluating and selecting manuscripts, and the editorial production area, which covers administrative, financial, marketing, and dissemination tasks. Currently, understanding this flow cannot ignore the transformations brought about by digitization and the movements toward open scientific knowledge, as pointed out by Abadal (2020). These movements have reconfigured editorial functions, skills, and practices.

The Open Access Movement, formalized by the Budapest Declaration (2002), was a response to the high costs of journal subscriptions, copyright restrictions, and the limitations of evaluation systems based on quantitative metrics (Sánchez-Tarragó, 2020). Practices such as self-archiving of preprints and the use of free software, already present in some scientific communities, have gained momentum and paved the way for initiatives such as institutional repositories, open access journals, and data sharing (Moore, 2017).

Recently, these initiatives have expanded and been coordinated under the concept of open science. Open science is understood as a collective effort to make scientific knowledge accessible, reusable, and collaborative. This effort involves researchers and society (United Nations Educational, Scientific and Cultural Organization, 2022). Open science encompasses practices such as open peer review, citizen science, open innovation, and data sharing. Silveira et al. (2023) organized these practices into ten categories, highlighting their complexity. Thibault et al. (2023) propose four topics for thinking about developments in open science: a) promoting transparency in methods; b) encouraging the sharing of research components; c) stimulating collaborative work; d) valuing openness as a research culture.

These topics are directly related to editorial policies and practices, as described below.

Transparency in research methods is central to addressing the so-called "reproducibility crisis," which is characterized by the difficulty of replicating findings across disciplines (Spinak, 2023). In response, research reporting guidelines, such as PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) and CONSORT (Consolidated Standards of Reporting Trials), were created, improved upon, and incorporated into the "Instructions for Authors" of many journals. These guidelines standardize the presentation of methods and results.

Sharing research components has also gained strength as an open science practice. In addition to the final article, researchers are encouraged to make protocols, data sets, computer codes, and preprints available. Research data, in particular, has come to be valued as an essential element of transparency and reproducibility. According to Sales and Sayão (2019), research data are records collected, observed, or generated in a research study that are necessary to validate its results.

This data is often deposited in specialized repositories, such as Dataverse, Zenodo, and Dryad. Another emerging practice is the data article, which describes a dataset and its metadata and can be published in specific journals (Roa-Martinez, Vidotti, & Santana, 2017). Despite its advantages, data publication still faces challenges such as a lack of standardization and clear editorial policies (Araújo & Príncipe, 2023; Dias, 2024) as well as a need to align with principles such as FAIR (findable, accessible, interoperable, and reusable) and CARE (focused on Indigenous data governance) (Araújo & Príncipe & Alencar, 2021).

Another development is enhanced publication, which links digital objects (e.g., articles, data, presentations, and videos), their metadata, and the semantic relationships between them (Bardi & Manghi, 2014). This modality promotes more integrated, contextualized retrieval of scientific information (Sales, Sayão, & Souza, 2013) but requires significant changes in editorial practices and journal management tools.

In this scenario, preprints have gained prominence, particularly during the pandemic, by accelerating the dissemination of knowledge. The Emerging Research Information (EmeRI) repository, created in 2020 by the Brazilian Association of Scientific Editors (Associação Brasileira de Editores Científicos - ABEC) and the Brazilian Institute of Science and Technology Information (Instituto Brasileiro de Informação em Ciência e Tecnologia - IBICT), is an innovative initiative that allows editors to select preprints during the peer review process (Brazilian Institute of Science and Technology Information, 2021).

One emerging model that stands out is Publish–Review–Curate, in which authors make preprints available that are later reviewed by journals, including overlay journals. Overlay journals combine editorial curation with externally hosted content, such as in open repositories (Brown, 2010). According to Rousi and Laakso (2024), this model has gained popularity in fields such as mathematics and physics due to its agility, transparency, and free access.

Within this model, the journal eLife takes an innovative approach: after peer review, preprints are published alongside the reviewers' comments and the authors' responses. Revised versions are then collected in the Reviewed Preprints section (Reviewed Preprints, 2025).

In Brazil, SciELO has promoted significant changes by aligning itself with the principles of open science. Its current model allows:

(a) Submission of preprints via SciELO Preprints;
(b) Subsequent submission to journals for evaluation;
c) Traditional submission directly to the journal.

Additionally, it promotes depositing data in SciELO Data and publishing reviews alongside articles (Scientific Electronic Library Online, 2023; Spinak, 2023).

These new forms of publication are driven by scientific evaluation practices that align with the principles of open science (Spinak, 2018). Rodrigues et al. (2023) highlight the emergence of peer review platforms and services based on collaborative, nonprofit communities that promote open, transparent, and collaborative reviews of preprints for traditional journals and overlay models. Notable examples include Peer Community In (PCI), which has thematic communities that review and recommend open-access preprints free of charge. These preprints can then be published in partner journals or in Peer Community Journal (PCI, 2024). Another example is PREreview, which seeks to foster greater equity in the review process by focusing on early-career researchers and historically marginalized groups (PREreview, 2024).

Inspired by these initiatives, the Pubfair conceptual model was conceived in 2019 by the Confederation of Open Access Repositories (COAR). The Pubfair model proposes a modular, distributed structure for scientific publications anchored in repositories of preprints, data, and software. This structure is complemented by evaluation, dissemination, and curation services. Pubfair values forms of evaluation that are open and adaptable to different types of digital objects and the specific demands of scientific communities (Ross-Hellauer et al., 2020).

In this context, the COAR Notify interoperability protocol was developed to facilitate communication between independent services such as repositories, overlay journals, and evaluation platforms (Rodrigues et al., 2023). It is currently being implemented by initiatives including PCI, the French repository HAL, the Episciences platform, the journal eLife, PREreview, and repositories such as bioRxiv, medRxiv, and SciELO Preprints.

Another central aspect of open science is **promoting scientific collaboration**. Given the complexity of contemporary challenges, collective, interdisciplinary, and transdisciplinary, efforts are necessary for achieving effective solutions (Tacke, 2008, as cited in Fecher & Friesike, 2013). Collaborative practices, such as teamwork and co-authorship, require recognizing different contributions throughout the research cycle. To this end, scientific journals have adopted the CRediT (Contributor Roles Taxonomy) taxonomy, launched in 2015, which defines specific author roles. Its benefits include recognizing contributions beyond writing the manuscript, promoting transparency and integrity in authorship, and supporting editorial management by identifying experts according to their roles (Allen, O'Connell, & Kiermer, 2019).

Thibault et al. (2023) also emphasize the importance of **cultivating a research culture** that values openness and transforming scientific practices. Two aspects are central to this process: the use of productivity and impact indicators, as well as the promotion of good research integrity practices. However, the inappropriate use of metrics in evaluating researchers and journals has been criticized (Aguado-López, Becerril-García, & Chávez-Ávila, 2019; Biagioli & Lippman, 2020; & Sánchez-Tarragó, 2021) because they can distort publication and sharing practices when used indiscriminately. This discourages values such as open access, transparency, rigor, collaboration, and integrity and, in extreme cases, favors unethical practices.

In this scenario, journals are encouraged to consider guidelines such as the San Francisco Declaration on Research Assessment (2012) and the Leiden Manifesto (Hicks et al., 2015). These guidelines are aligned with the UNESCO Recommendations for Open Science (United Nations Educational, Scientific and Cultural Organization, 2022). These statements advocate

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reducing dependence on traditional metrics, such as the impact factor, and adopting more meaningful indicators, such as altmetrics, which measure scientific impact through repercussions in digital environments and social networks (Barros, 2015).

Fostering a culture of open science requires strengthening research integrity practices in editorial policies. These policies should adhere to the guidelines of organizations such as the Directory of Open Access Journals (DOAJ) and the Committee on Publication Ethics (COPE), which establish ethical standards for open and transparent scientific publishing.

However, these transformations present economic, socio-technical, and ethical-political challenges for the scientific community, including journal editors. From an economic standpoint, open science initiatives incur substantial costs related to infrastructure, human resources, and training. At the socio-technical level, cultural resistance and established practices persist in the publishing field. As Sheliga and Friesike (2014) observe in their article "Putting Open Science into Practice: A Social Dilemma?," the benefits to the collective are not always perceived as advantageous at the individual level, especially under the pressure of science's productivity-based evaluation systems.

In the ethical-political realm, Albagli (2015) emphasizes that open science requires a commitment to research integrity that extends beyond combating plagiarism. This commitment involves an ethical pact in which researchers appropriate shared knowledge and make their own knowledge available responsibly and honestly. Added to this is the challenge of inequalities in the production and circulation of knowledge. Sánchez-Tarragó (2020, p. 21) warns of "new forms of knowledge privatization, colonialism, Eurocentrism, and exclusion" associated with the commercialization of open access. The open access model based on article processing charges (APCs) has widened inequalities, benefiting large publishers and researchers in the Global North (Sánchez-Tarragó, 2021).

Alternatives are emerging, such as "diamond" journals, which do not charge authors or readers (Becerril, López, & García, 2023), and distributed models based on preprints and collaborative review, like PCI and PREreview. Additionally, there is a growing call for editorial practices guided by values of equity, justice, diversity, and inclusion (United Nations Educational, Scientific and Cultural Organization, 2022).

As Reinsfelder (2012) argues, scientific journals, through their editors, exert significant influence over other actors in the scientific communication system. Their editorial policies and practices influence the behavior of researchers. In the face of the socio-technical, ethical, and cultural challenges posed by open science, editors must develop new skills to effectively, critically, and constructively navigate this ecosystem.

3 PROFESSIONAL SKILLS, JOURNAL PUBLISHING, AND OPEN SCIENCE

Competence is defined as a combination of knowledge, skills, and attitudes that are directly related to job performance and can be improved through training and development (Silva Júnior & Ramos, 2008). Therefore, being competent means possessing this combination of attributes, giving one the ability to satisfactorily perform tasks (Aulete, 2011). According to Tejada Artigas and Tobón Tobón (2006), competence requires an interrelation of theory and practice as well as a critical perspective that can guide performance in specific contexts and enable the formulation or resolution of problems. Thus, professional competencies encompass cognitive-procedural (knowledge of the profession's theories or principles), communicative, social, and ethical dimensions.

In the field of library and information science, various classifications and systematizations of professional competencies were developed by universities and professional associations between the late 1990s and early 2000s (Moreiro González & Tejada Artigas, 2004). Among these, Tejada Artigas and Tobón Tobón's (2006) taxonomy stands out. It organizes librarians' competencies into five core areas: **information competency, management cycle competency,**

information technology competency, communication competency, and general competency. The mobilization of these competencies, as well as others, depends directly on the librarian's area of expertise.

In recent decades, the presence of these professionals in book and periodical publishing has grown significantly, keeping pace with advances in digitization processes and the emergence of open science movements. Currently, librarians work in various editorial spaces, such as publishing houses, libraries, portals, and scientific journals. They perform functions that require an integrated knowledge of library science, information science, publishing, and information technology, among others.

Table 1 presents the main activities performed by librarians in publishing. Many also work as executive editors or editors-in-chief, implementing editorial policies, coordinating processes, and leading teams. They carry out these activities in a dynamic environment marked by constant changes and socio-technical challenges, as discussed in the previous section.

The five core competencies identified by Tejada Artigas and Tobón Tobón (2006) are essential for librarians working in scientific journal publishing. Those related to content editing and publishing are of particular note, as they fall within the scope of information and information technology competencies. Information competence refers to the set of skills necessary for effectively using information resources to solve problems, especially in contexts marked by information overload (Zurkowski, 1974, as cited in Belluzzo, 2020). Critical information competence goes beyond assessing data quality to include judging the relationships between information, power, and social transformation. According to Doyle and Brisola (2022), this competence is crucial when facing contemporary challenges where the production, use, and access of information intersect with ethical, political, and social dimensions.

These competencies allow librarians to manage information flows and strategically position themselves to lead editorial processes. Furthermore, critical information literacy is necessary to identify the power struggles and epistemic inequalities that permeate scientific communication. A fundamental attribute allows librarians to act as agents of transformation, promoting fairer and more inclusive editorial practices and policies.

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Chart 1. Activities performed by librarians in publishing

Editorial management	Editorial production
o Development of editorial projects and policies; o Management of manuscript flow; o Administration of publishing platforms and journal portals; o Advising authors on copyright and licensing issues; o Scientific marketing and content creation for social media; o Conducting metric studies for journal evaluation; o Indexing in databases and institutional repositories.	o Text editing and revision; o Correction and standardization of citations and references; o Preparation of figures and tables; o DOI management; o Layout and creation of PDFs and other versions; o XML markup.

Source: Santillán-Aldana e Mueller (2016), Santana e Francelin (2016), Rozemblum e Banzato (2012).

Some studies have explored the specific skills required of librarians working in scientific publishing. For example, Keener (2014) discusses essential skills in digital and open access environments. The author emphasizes the importance of training that integrates theory and practice by combining traditional library science skills with those specific to academic publishing.

- **Technical and theoretical knowledge of publishing,** including an understanding of editorial processes such as peer review, licensing, and open access policies.
- **Digital technology skills:** Proficiency in digital publishing tools and platforms such as scientific journal management systems (e.g., Open Journal Systems), desktop publishing software, institutional repositories, and e-book platforms. Proficiency in markup languages (e.g., XML), scripting languages (e.g., JavaScript and PHP), and relational database query languages (e.g., SQL) is essential for automating editorial processes and ensuring interoperability between systems.
- **Ability to collaborate across disciplines:** Work with researchers, authors, and other professionals involved in the editorial process.
- **Knowledge of copyright and licensing**: Familiarity with legal issues related to publishing, including Creative Commons licenses and institutional policies.
- **Strong communication and writing skills:** Ability to write, edit, and communicate effectively with different audiences, adapting language as needed.
- **Commitment to ethics and academic integrity:** Adherence to ethical principles when conducting editorial activities and promoting integrity in research.
- **Critical thinking:** The ability to question traditional forms of publication, adapt to industry dynamics, and contribute innovative ideas. Understanding power relations in the publishing industry and prioritizing the use of information for the benefit of humanity are also important.

Farias, Lima, and Santos (2018) organize competencies into three dimensions: **knowledge, skills, and attitudes**, as summarized in Chart 2.

Chart 2. Skills required working in publishing

| Knowledge	Skills	Attitudes
o Proficiency in digital platforms for scientific journal management. o Familiarity with publication standards and journal indexing and classification systems. o Technical knowledge of proofreading, text editing, standardization, and indexing. o Understanding of the editorial workflow of scientific journals and the publishing market.	o Experience in different areas of publishing, such as editorial assistance, proofreading, layout, and training. o Technical skills to operate digital platforms and publishing technologies. o Leadership, negotiation, and communication skills to establish partnerships and achieve goals. o Ability to adapt to technological and regulatory changes in the publishing market.	o Autonomy and proactivity in pursuing specialization. o Characteristics such as concentration, creativity, curiosity, emotional intelligence, organization, resilience, holistic vision, and aesthetic sense. o Sensitivity in dealing with different profiles of editors and members of the editorial board. o Willingness to collaborate, promote professional marketing, and conduct training.

Source: Farias, Lima e Santos (2018).

Although these classifications consider contemporary trends such as open access, it is crucial to explore skills related to open science further, given its transformative impact on scientific communication and publishing. One reference document on the subject is the 2020 report by the European Research Library Association (LIBER, Ligue des Bibliothèques Européennes de Recherche), which is based on frameworks such as DigComp 2.0, materials

from the FOSTER+ project, and LIBER's Open Science Roadmap. The competencies are organized into five main categories (Figure 1).

- **Data**: Research data management, data management plans (DMPs), curation, big data, data mining, FAIR and CARE principles, and compliance with institutional policies.
- **Metrics**: Mastery of traditional and alternative metrics to support scientific evaluation.
- **Scientific publishing:** Journal and repository management, open licensing, intellectual property, and persistent identifiers.
- **Research integrity:** Ethical practices and prevention of scientific misconduct.
- **Citizen science:** Public engagement through accessible communication and active participation in the scientific process.

Figure 1. Competencies for open science
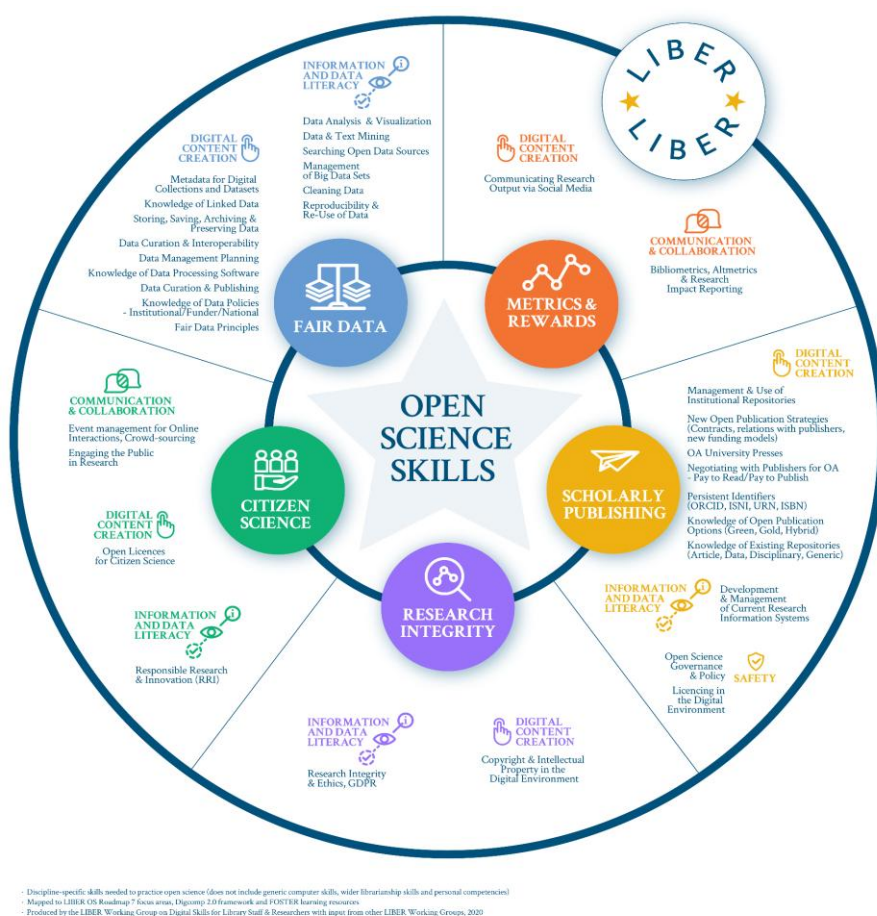
These skills are directly linked to librarians' editorial work. Specifically, an editor must master data management, promote open science policies, support open access publishing models, adopt appropriate licenses, and adhere to ethical guidelines.

The next section details the methodological procedures adopted in this research based on the considerations in sections 2 and 3.

4 METHODOLOGICAL PROCEDURES

This research aims to identify the skills necessary for librarians to succeed in the open science ecosystem and the challenges they face, with a focus on activities related to scientific journal publishing. This exploratory and descriptive study takes a qualitative approach. The study is based on a narrative review of the literature, a method characterized by its qualitative and flexible approach that does not require rigid protocols for searching and selecting sources. Additionally, the study discusses empirical data collected through structured interviews with Brazilian librarians who edit journals in the field of information science.

Preliminary searches were initially conducted in the BRAPCI, SciELO, Dimensions, and Scopus databases to comprehensively cover the research's main concepts: librarians, publishing, open science, and competencies. These searches were conducted in three languages: Portuguese, Spanish, and English. However, the results were scarce, focusing mainly on general professional competencies and aspects of scientific publishing. Due to these limitations, the focus of the searches was shifted to the competencies of librarians in the context of open science. In a second stage, connections were established with their activities in journal publishing.

After conducting several tests, we found that the Dimensions database was the most suitable because it provided the most relevant and comprehensive results. This multidisciplinary platform, maintained by Digital Science, is recognized for its extensive coverage of open-access sources. On March 14, 2024, we conducted the searches using the "Title and Abstract" field with the following strategies:

a) *Competência* AND "*ciência aberta*" AND *bibliotecário*
b) *Competencia* AND "*ciencia abierta*" AND *bibliotecario*
c) Skills AND "open science" AND librarian
d) Competence AND "open science" AND librarian

Based on these strategies, 32 documents were retrieved. After reviewing the abstracts for thematic relevance and open-access availability, the final corpus consisted of 15 texts. The documents were read in their entirety, and data related to competencies and challenges were extracted for further categorization and analysis using the content analysis technique. The objective was to establish relationships between the identified competencies and librarians' performance in editing scientific journals.

Competencies were categorized using four LIBER categories: data, scientific publishing, metrics, and research integrity. The category "Citizen Science" was not used because its relationship with publishing processes is considered less significant. The identified challenges were categorized into six dimensions based on the consulted literature and the content itself: technical, socio-technical, ethical, legal, financial, training, and institutional.

The literature review was contrasted with the empirical data obtained during Oliveira's (2023) research. For this study, seven information professionals with recognized experience publishing open-access scientific journals in Library and Information Science were interviewed. To include institutional and regional diversity, the selection of interviewees included participants from the states of Maranhão, Paraíba, Alagoas, the Federal District, São Paulo, Paraná, and Santa Catarina, covering the Northeast, Midwest, Southeast, and South regions.

Data were collected using a semi-structured electronic form developed on the Google Forms platform. This method was chosen due to the participants' wide geographical distribution, enabling remote and asynchronous interviews. Invitations were sent individually via email, and the form was available from May 26 to June 10, 2023.

The responses were submitted to a content analysis to identify the participants' skills and activities, the challenges they faced in the context of open science, and their perceptions of innovative editorial practices. Additional details on the methodological procedures can be found in Oliveira (2023).

In this article, we analyzed the interview responses in light of the literature review findings to identify commonalities or differences.

5 RESULTS AND DISCUSSION

Of the 15 documents resulting from the Dimensions database search, six addressed various librarian skills related to open science in general. Meanwhile, seven focused specifically on open data skills, considering technical, legal, organizational, and financial aspects. These results underscore the increasing importance of data and its management throughout the research cycle. These competencies are also essential for working in journal publishing (see Chart 3).

Chart 3. Skills required of librarians working in open science

Data Skills	Skills in Scientific Publishing	Metrics Skills	Research Integrity Skills
o Collection, processing, management, evaluation, and use of data for scientific research (Federer et al., 2020). o Data curation: Authentication, archiving, preservation, retrieval, and representation of research data (Constantinescu, 2018). O Research data management (RDM): Planning, storage, versioning, and sharing of data (Boté-Vericad; Healy, 2022). o FAIR principles: Knowledge of guidelines for making data findable, accessible, interoperable, and reusable (Džoić; Grzunov, 2022). o Data visualization: Use of tools to present and analyze data in a clear and understandable way (Kaliuzhna, 2023). o Data education: Teaching fundamental data concepts and practices to specific audiences (Federer et al., 2020).	o Open access: Support for open publishing practices and copyright management, including Creative Commons licenses (Ribeiro; Oliveira; Diniz, 2024). o Editorial planning and management: Development of editorial policies, metadata guidelines, and editorial workflow management (Redkina, 2023). o Preprint management: Ability to handle the submission, review, and publication of preprints (Schmidt et al., 2023). o Author training: Guidance on publishing practices and editorial standards (Redkina, 2021). o Publishing systems: Familiarity with digital platforms and publishing	o Alternative metrics (altmetrics): Knowledge of tools and indicators for measuring the impact of scientific publications (Kaliuzhna, 2023). o Impact assessment: Ability to interpret and apply traditional and alternative metrics in editorial contexts (Ribeiro; Oliveira; Diniz, 2024). o Impact monitoring: Use of open tools to analyze the dissemination and impact of open science (Kaliuzhna, 2023).	o Transparency and ethics: Ensuring good practices in research and preventing scientific misconduct (Schmidt et al., 2023). o Open peer review: Ability to implement and manage transparent evaluation processes (Federer; Clarke; Zaringhalam, 2020). o Responsibility in data curation: Ensuring the quality and integrity of data used and shared (Constantinescu, 2018).

Data Skills	Skills in Scientific Publishing	Metrics Skills	Research Integrity Skills
	software (Redkina, 2023). o Institutional repositories: Skills for repository management (Džoić; Grzunov, 2022). o Contracts with publishers: Legal aspects and business models (Džoić; Grzunov, 2022).		

Source: Prepared by the authors (2024).

Chart 3 shows that librarians play a multifaceted role in the open science ecosystem, requiring skills that go far beyond traditional functions. Regarding contemporary scientific publishing, notable skills include open access, editorial management, use of publishing systems, author training, and preprint management. These skills range from supporting the adoption of open licenses to planning and managing editorial policies, workflows, and metadata guidelines. Additionally, mastery of digital platforms and publishing software is essential, as is familiarity with institutional repositories and the legal aspects of contracts with publishers.

Librarians should also develop skills in scientific evaluation metrics, including the use and interpretation of alternative metrics (altmetrics), as well as in research integrity practices, such as promoting open peer review and ensuring transparency in editorial processes. The skills listed by Schmidt et al. (2023), for example, directly align with the activities of editors or editorial team members because they involve declaring the availability of data and software, peer-reviewing data sets, citing data, and knowing formats and platforms for data publication. Organizing events and training on research integrity and reproducibility and providing guidance on the use of specific tools can also be considered relevant skills for librarian-editors.

Two skills mentioned in these studies are widely cited: data management and curation. In the context of open science, these skills are fundamental to the current scientific publishing landscape, where the role of the editorial team extends beyond handling manuscripts to include managing research data. This data should be made available as supplementary information, promoting scientific validation and supporting new research development.

The analyzed studies indicate that some open science practices, such as open access and open data, are already partially integrated into the work of scientific journal editors. These practices require skills related to reproducibility, the use of free and open-source software (such as Open Journal Systems — OJS), and the application of metadata guidelines.

Conversely, less widespread practices require librarians to develop technical and theoretical expertise to effectively introduce open science into their professional activities. Therefore, editor-librarians must be prepared to act strategically and promote the adoption of innovative practices that align with open science principles.

To meet these demands, Federer, Clarke, and Zaringhalam (2020), as well as Federer and Qin (2019), emphasize that librarians must adopt a lifelong learning approach and develop an "anthropological" mindset capable of understanding different research cultures.

These authors also emphasize the importance of the continuous pursuit of computational literacy, which is essential for the dynamic context of open science.

Such skills are fundamental to consolidating the role of librarians as strategic agents in the mediation of scientific knowledge, actively contributing to the democratization of information and the promotion of more ethical, open, and inclusive scientific communication.

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The transition to open science also poses several challenges for librarians. Chart 4 summarizes the main obstacles or challenges identified in the documents analyzed, categorized into six dimensions: technical, sociotechnical, ethical, legal, financial, educational, and institutional.

Chart 4. Challenges faced by librarians in the open science ecosystem

Technical Challenges	Sociotechnical Challenges	Ethical and Legal Challenges
o Adapting to fragmented technologies that support open science (Redkina, 2021). o Managing the complexity of data and service workflows (Huang et al., 2020). o The need for open tools and digital infrastructure to support and monitor open science (Kaliuzhna, 2023).	o Overcoming limited acceptance of open data within institutions (Huang et al., 2020). o Changing mindsets to combat outdated conceptions about the role of librarians (Farrell, 2023). o Difficulties in collaborating effectively with researchers due to cultural or communication barriers (Rammutloa, 2023). o Low awareness of the importance of open science among researchers, managers, and librarians (Huang et al., 2020; Povestca, 2022; Ribeiro; Oliveira; Diniz, 2024). o Cultural resistance within institutions that hinders the adoption of open science practices (Huang et al., 2020; Rammutloa, 2023).	o Problems related to legal and political issues that prevent data reuse (Boté-Vericad; Healy, 2022; Farrell, 2023). o Barriers of institutional policies and regulations that are not aligned with open science practices (Huang et al., 2020; Povestca, 2022).
Financial Challenges	Training and Education Challenges	Organizational and Institutional Challenges
o Lack of funding and resources for training and infrastructure (Huang et al., 2020; Povestca, 2022). o High costs associated with developing research data management services (Boté-Vericad; Healy, 2022).	o Gap in skills and knowledge needed in data science and open science (Federer; Qin, 2019; Huang et al., 2020; Rammutloa, 2023). Need for ongoing training and professional development (Povestca, 2022; Federer; Clarke; Zaringhalam, 2020). o Lack of inclusion of open science concepts in library science training programs (Džoić; Grzunov, 2022). o Lack of technical skills necessary for data management, curation, and use of digital tools (Constantinescu, 2018; Huang et al., 2020; Povestca, 2022).	o Lack of clear institutional policies to support open science (Huang et al., 2020; Povestca, 2022). o Lack of formal recognition of the new roles of librarians related to open science (Constantinescu, 2018; Redkina, 2023). o Shortage of qualified personnel to handle the demand for open science services (Huang et al., 2020; Rammutloa, 2023).

Source: Prepared by the authors (2024).

Based on the challenges identified in Chart 4, it is clear that the barriers librarians face in the open science ecosystem are directly linked to scientific publishing practices. Therefore, overcoming these challenges is crucial for librarians to effectively fulfill their roles in scientific publishing and promote more open, ethical, and inclusive scientific communication.

The results of the empirical research corroborate and expand upon some evidence presented in the literature. Below, we present the perspectives of the librarian editors interviewed to verify how the identified skills and challenges manifest in Brazilian publishing practices.

All seven interviewees have a background in library and information science, and most have more than six years of experience in publishing. Their duties mainly include managing manuscripts and reviewers (100%), developing editorial policies and layout (85%), indexing (85%), seeking funding (85%), and activities such as editorial design, digital marketing, and social media management (71.5%). Fifty-seven percent of the librarians do proofreading, while text markup (XML/HTML) and monitoring alternative metrics are more occasional tasks.

The editors pointed out several open science practices adopted by the journals under their supervision, including open access to articles, open peer review, publication of open data and preprints, use of alternative metrics, and scientific outreach on social networks. These practices suggest that the journals are adopting contemporary methods that align with open science initiatives.

Regarding the skills required for a career in scientific publishing, the interviewees identified three primary areas. **Essential knowledge** includes scientific communication, text standardization, metrics, databases, indexing, metadata, and copyright. **Practical skills** include layout, content management, editorial policy development, use of technological tools, and social media outreach strategies. In terms of **attitudes**, ethics, teamwork, leadership, conflict resolution, and providing ongoing support to researchers are important. These responses align with the competencies systematized by Keener (2014) and Farias, Lima, and Santos (2018).

When asked about the specific skills required by open science, nearly all respondents acknowledged the need for additional skills, particularly in open data management and open evaluation. This reflects the transformations in the publishing ecosystem. These perceptions align with those of the Ligue des Bibliothèques Européennes de Recherche (2020), Constantinescu (2018), Federer and Qin (2019), Federer et al. (2020), and Boté-Vericad and Healy (2022).

The challenges identified in the literature are also evident in the publishing activities of Brazilian scientific journal editors. Below is a summary of these professionals' perceptions linked to the findings of the specialized literature.

The main challenges reported are financial, such as a lack of institutional funding and the prevalence of volunteer work. These conditions compromise the sustainability of journals and motivate consideration of the article processing charge (APC) model. Huang et al. (2020) and Povestca (2022) corroborate this reality, emphasizing the scarcity of resources for training and infrastructure to support open science. Boté-Vericad and Healy (2022) reinforce this perspective, pointing out the high costs of creating and maintaining services, particularly those related to data management.

At the institutional level, interviewees emphasized the low-value and insufficient recognition of editorial activities in career advancement and other evaluation processes. The lack of formal recognition of librarians' editorial functions and the absence of institutional policies to support open science undermine the value of these professionals and the sustainability of scientific journals, particularly those associated with public institutions.

At the operational level, the following challenges were mentioned: low commitment from reviewers, difficulties using platforms, and high turnover of scholarship recipients. These issues align with Redkina's (2021) description of technological fragmentation, which hinders the

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implementation of open practices, and with Huang et al.'s (2020) identification of challenges related to workflow management in unstable digital environments.

From a technical standpoint, editors noted difficulties meeting indexing requirements and managing submissions. In the sociotechnical field, resistance to open evaluation was identified as a recurring obstacle, as discussed by Boté-Vericad and Healy (2022). Additionally, interviewees mentioned significant training gaps related to open data, preprints, and alternative metrics, which create uncertainty among authors and evaluators alike. Federer et al. (2020) and Boté-Vericad and Healy (2022) reinforce this finding and argue for the need for librarians to receive specific training in open science practices and tools. Huang et al. (2020) complement this analysis by pointing out the low awareness and insufficient technical preparation among professionals involved in these processes.

In summary, the results of the empirical research confirm the importance of the skills described in the literature, such as data management, research integrity, the use of alternative metrics, and the mastery of digital tools. The results also show that although some open science practices have been partially incorporated into editorial work, structural and educational barriers persist, limiting their consolidation. A lack of institutional support, reliance on volunteers, technical barriers, and resistance to models such as open evaluation and preprint use indicate a discrepancy between discourse and practice. These findings underscore the need for coordinated efforts between professional training, institutional policies, and the recognition of editorial work to effectively integrate open science into the practices of the library and Information Science community.

6 CONCLUSION

The goal of this research was to identify the necessary skills and challenges that librarians encounter in the open science ecosystem, particularly in activities related to scientific journal publishing. The investigation revealed that skills in data management, scientific publishing, metrics, and research integrity are central to this context.

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A literature review revealed the increasing significance of open scientific data and its relationship with journals. It also emphasized the necessity of monitoring developments in new scientific communication ecosystems, which consist of journals, repositories, preprints, open evaluation systems, and interconnected services. The importance of adopting responsible metrics, including alternative indicators, to more broadly and transparently assess the impact of scientific knowledge was also reinforced.

Ethics, good practices, and research integrity were established as the foundations of open science and should guide all stages of editorial work to promote transparency, reliability, and social commitment in scientific communication.

Librarians develop their professional skills throughout training and consolidate them in practice. In the open science landscape, the ability to "learn to learn" and keep up with technological, regulatory, and social changes is paramount. For those working in scientific publishing, this adaptability is essential for promoting editorial practices aligned with open science and contributing to the ethical and equitable circulation of knowledge.

The following challenges stand out among those identified in the literature: technically, there is fragmentation of technologies and a lack of open digital infrastructure. Sociotechnically, there is institutional resistance and outdated views on the role of librarians. Ethically and legally, there is an absence of policies compatible with open practices and restrictions on data reuse. Financially, there is a scarcity of resources for training and maintenance of specialized services. Training-wise, there are gaps in library science curricula regarding data curation and management. At the institutional level, there is a lack of support policies and low recognition of librarians' new roles.

The empirical stage reinforced this evidence, pointing out that practices such as open peer review, research data management, preprint use, and alternative metrics adoption still face resistance and a lack of awareness within the academic community. Editors who were interviewed reported that authors and reviewers were unfamiliar with these practices, hindering their implementation. Additionally, limited human and financial resources compromise the sustainability of journals, especially those without institutional support, exacerbating the challenges librarian editors face.

In this context, it is evident that there is a clear need to develop specific skills in areas such as research integrity, editorial quality, data management, and the mastery of both traditional and alternative metrics, as well as the ethical use of information. These skills are essential for librarians to operate the technical aspects of scientific publishing and act strategically in promoting editorial practices that align with the principles of open science. These professionals must position themselves as active agents in promoting good practices and consolidating an open, inclusive, and responsible editorial culture.

One limitation of the research is the non-exhaustive nature of the literature review. Future investigations may expand the range of descriptors and sources to include other theoretical approaches and broaden the analytical scope. Additionally, further empirical studies on the skills, practices, and perceptions of editors in Library and Information Science regarding open science are recommended.

Nevertheless, we hope that the results presented here will support training and capacity-building initiatives for librarians and contribute to the development of syllabi and specialized courses focused on scientific publishing and open science.

It is important to note that open access journals play a strategic role in democratizing knowledge and promoting information equity. It is essential for these professionals to reflect on these dimensions and the social role of librarians in mediating information and stimulating social and intellectual development to continue contributing actively and critically to a more accessible, collaborative, and transformative science.

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