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Open Access as a Mechanism to Support Scientific Research: Opportunities and Challenges

الوصول المفتوح كآلية لدعم البحث العلمي: الفرص والتحديات

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Abstract:

Open Access has reshaped scholarly communication by removing financial, legal, and technical barriers to research output, promoting wider dissemination, higher citation impact, and equitable access to information. Global initiatives such as the Directory of Open Access Journals (DOAJ) and national platforms like the Algerian Scientific Journal Platform (ASJP), along with institutional repositories, have strengthened the adoption of Open Access and enhanced visibility of academic production.

However, the movement still faces challenges, including sustainable funding, predatory publishing practices, copyright issues, and inconsistent policy implementation at institutional and national levels. This paper explores the role of Open Access in supporting scientific research through a qualitative documentary analysis of its main opportunities and challenges, while examining international and Algerian initiatives that shape the future of scholarly communication.

Keywords: Open Access, scholarly communication, scientific research, digital publishing, opportunities, challenges.

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ملخص

قام الوصول الحر بتشكيل منظومة الاتصال العلمي من خلال إزالة الحواجز المالية والقانونية والتقنية أمام إنتاج المعرفة، مما ساهم في توسيع نشر الأبحاث، وزيادة تأثيرها ومرئيتها، وتحقيق العدالة في الوصول إلى المعلومات. وقد دعمت مبادرات عالمية مثل دليل المجلات العلمية مفتوحة الوصول(DOAJ) ، ومنصات وطنية مثل المنصة الجزائرية للمجلات العلمية(ASJP) ، إضافة إلى المستودعات المؤسساتية انتشار ثقافة الوصول الحر وتعزيز إتاحة الإنتاج الأكاديمي.

غير أنّ هذا التوجه يواجه تحديات مستمرة، أبرزها التمويل المستدام، انتشار المجلات المفترسة، قضايا حقوق الملكية الفكرية، وتفاوت تبنّي السياسات المؤسسية والوطنية. تسعى هذه الورقة إلى إبراز دور النفاذ الحر في دعم البحث العلمي، من خلال تحليل وثائقي نوعي لفرصه وتحدياته، مع تسليط الضوء على المبادرات الدولية والجزائرية التي ترسم مستقبل الاتصال العلمي في بيئة منفتحة وتعاونية.

الكلمات المفتاحية :الوصول الحر، الاتصال العلمي، البحث العلمي، النشر الرقمي، التطبيقات، التحديات..

INTRODUCTION

Over the past two decades, the system of scholarly communication has changed profoundly. The traditional subscription-based publishing model often criticized for restricting access to research has gradually given way to a more open and inclusive approach known as the Open Access (OA) movement. Since its formal recognition in the early 2000s through the Budapest Open Access Initiative (2002), the Bethesda Statement, and the Berlin Declaration, OA has evolved from an experimental idea into a central component of global science policy. Its main goal is both simple and transformative: to remove financial and legal barriers to academic research so that scholarly work can be freely accessed, read, and reused by anyone, anywhere(Suber, 2012).

This transformation reflects a strong ethical and intellectual belief that knowledge produced through public funding should be treated as a public good(UNESCO, 2021). By promoting unrestricted access to research, OA helps to speed up scientific discovery, increase the visibility and citation of scholarly work, and support a fairer distribution of knowledge across countries and institutions. Major research funders such as the National Institutes of Health (NIH), the European Commission, and the Coalition S through *Plan S* have turned these principles into formal policies that require publicly funded research to be openly available(cOAlition S, 2018). As a result, OA is no longer seen as an alternative publishing option; it has become a core strategy for sharing, evaluating, and advancing scientific knowledge worldwide.

1.Problem Statement

Although OA has been widely embraced as a means to democratize knowledge and promote equitable access to research, its implementation remains uneven and often problematic. The transition from subscription-based publishing to open models has introduced new economic, structural, and ethical challenges that risk undermining the movement's original goals. Issues such as publication fees, quality assurance, and sustainability reveal a growing gap between OA's ideals and its real-world practices. This situation calls for a critical re-examination of how OA can truly function as a fair and sustainable mechanism for advancing scientific communication.

2. Research Questions

This article explores how Open Access (OA) can function as a mechanism to support scientific research while addressing the challenges that constrain its potential. It is guided by the following key questions:

1. What opportunities does OA offer in enhancing the visibility, accessibility, and impact of scientific research?
2. What major challenges continue to hinder the effective and equitable implementation of OA?
3. Which emerging strategies and policy approaches show promise in guiding OA toward a more sustainable and inclusive model of scholarly communication?

3. Methodological Approach

This study employs a qualitative analytical method based on documentary analysis. It synthesizes insights from recent literature, policy documents, and institutional reports to explore how Open Access operates as a mechanism for advancing scientific research.

4.Conceptual Framework of Open Access

4.1 Definition and Core Principles of Open Access

Open Access refers to the free, immediate, and unrestricted online access to scholarly research outputs, allowing anyone to read, download, copy, distribute, and use the materials without financial, legal, or technical barriers.

According to UNESCO, OA means that research literature is made available on the public internet without cost to the reader, and users are granted rights to use, distribute, and build upon the work provided attribution is preserved(UNESCO, 2023); This definition aligns with institutional and publisher-based definitions as Springer Nature that emphasize both the removal of access costs and the rights of reuse in the digital environment(Springer Nature, n.d.)

The core principles of OA include *accessibility, transparency, author attribution, legal reuse, and sustainability*. These principles assert that scholarly knowledge,

especially when funded by public or institutional resources, should serve as a common good rather than a commodity.

4.2 Open Access Models

OA publishing does not follow a single approach but rather encompasses a spectrum of models that enable free access to scholarly work. Understanding these models is essential for analyzing the dynamics of openness and the sustainability of scholarly communication:

- **Gold OA:** refers to articles that are made freely available immediately upon publication on the publisher's website. In this model, the cost of publication is typically transferred from the reader to the author through *Article Processing Charges* (APCs). While this ensures immediate global access, it also introduces economic disparities, as researchers from less-resourced institutions may struggle to cover publication fees(Piwowar et al., 2019). Major publishers such as *PLOS* and *BioMed Central* have played a central role in popularizing this approach.

- **Green OA**: known also self-archiving, it allows authors to deposit a version of their manuscript often a pre-print or post-print into institutional or disciplinary repositories, sometimes after an embargo period set by publishers. This model promotes dissemination through publicly accessible archives such as *arXiv* or *PubMed Central*, helping to reduce costs and dependency on commercial publishers (Suber, 2012). Nevertheless, differences in embargo periods, repository infrastructure, and copyright policies continue to limit its uniform adoption across disciplines.

- **Hybrid OA**: refers to journals that operate under a mixed model. They remain primarily subscription-based but provide authors the option to make individual articles openly available upon payment of a fee. This flexibility extends access but has drawn criticism for encouraging "double dipping," as publishers collect both subscription revenues and APCs (Björk, 2017). Consequently, many policy makers question the sustainability of this approach within equitable OA ecosystems.

- **Diamond OA**: also called *Platinum OA* , it eliminates financial barriers for both authors and readers. It relies on institutional subsidies, research grants, or voluntary editorial efforts rather than fees. This model aligns closely with the ethical principles of OA by ensuring inclusivity and equity, though it faces challenges in maintaining financial stability and scalability (Piwowar et al., 2019).

Overall, these models demonstrate that Open Access is not a uniform system but a diverse and evolving ecosystem shaped by financial, institutional, and disciplinary realities. The effectiveness of each model depends on its capacity to balance openness with quality, equity, and long-term sustainability in global scientific communication.

4.3 The Role of Digital Infrastructures and Policy Frameworks in Advancing Open Access

OA relies on the integration of strong digital infrastructures with coherent policy frameworks that regulate how scholarly outputs are disseminated, preserved, and reused. At the international level, frameworks such as **Plan S** launched by *cOAlition S* in 2018 require that all publicly funded research be made openly accessible under liberal licensing (e.g., CC BY) and deposited in approved repositories. Similarly, the **UNESCO** Recommendation on Open Science (2021) establishes global principles for transparency, inclusivity, and interoperability in research dissemination.

In Europe, the **OpenAIRE** initiative provides both infrastructure and policy guidance to harmonize repository standards and compliance monitoring across member states. The U.S. Office of Science and Technology Policy **(OSTP)** Public Access Memorandum further mandates immediate open access to federally funded research publications and underlying data.

Collectively, these frameworks demonstrate a global shift toward institutionalizing openness through coordinated policy action and robust digital infrastructures, ensuring that open access becomes an integral part of the research lifecycle rather than a voluntary practice.

5. Open Access as a Mechanism for supporting Scientific Research

5.1 Enhancing Visibility and Impact of Research Outputs

Open Access significantly increases the visibility, readership, and citation impact of scholarly work. By removing paywalls, it allows research to circulate beyond academic institutions and reach a wider global audience, including independent scholars and practitioners. Recent studies confirm a measurable *"open-access citation advantage"*, showing that OA articles tend to receive more downloads and citations than subscription-based ones (Huang et al., 2020; Piwowar et al., 2019). In this sense, OA enhances individual researcher visibility, and also strengthens institutional reputation and accelerates the overall dissemination of knowledge.

As of 2025, the Directory of Open Access Journals (DOAJ) indexes over 22,000 journals from 139 countries, representing more than 11 million article records. These figures highlight the global expansion and linguistic diversity of OA publishing, confirming its growing role in making research outputs visible and accessible worldwide (DOAJ, 2025).

Figure 1. Global Overview of the Directory of Open Access Journals (DOAJ, 2025)



5.2 Facilitating Knowledge Sharing and Collaboration

Open Access fosters a more collaborative and transparent research environment by enabling unrestricted sharing of scholarly outputs across disciplinary and geographic boundaries. When research findings, data, and methodologies are freely accessible, they reach a broader community of scholars, students, and professionals, including those from institutions with limited resources. This openness promotes

interdisciplinary research, accelerates innovation, and strengthens the collective advancement of knowledge.

Recent studies highlight that OA infrastructures such as institutional repositories, preprint servers, and open data platforms play a pivotal role in connecting researchers and facilitating real-time exchange of ideas(Jahn, 2025; Tennant et al., 2016). By reducing access barriers and promoting open peer review and data reuse, OA contributes to a more inclusive and transparent global scholarly ecosystem.

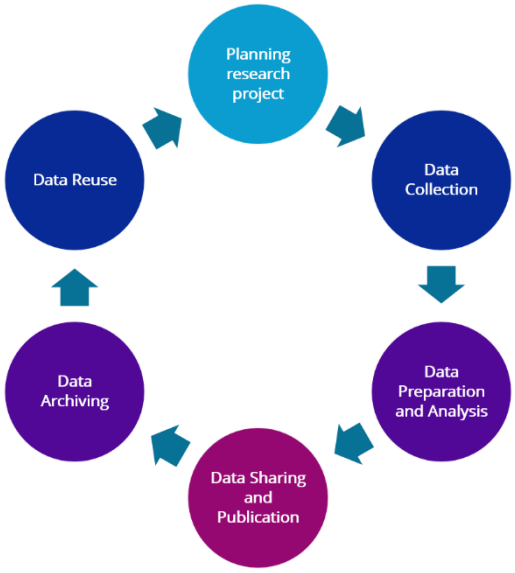
5.3 Strengthening Transparency and Reproducibility in Research

Open Access reinforces the fundamental principles of transparency and reproducibility that underpin scientific inquiry. By allowing unrestricted access to data, methods, and results, it enables other researchers to examine, verify, and replicate findings with greater ease. Such openness cultivates a research culture grounded in accountability and collective validation rather than exclusivity. The adoption of frameworks such as the FAIR principles (Findable, Accessible, Interoperable, and Reusable) and the Transparency and Openness Promotion Guidelines reflects a growing institutional commitment to these values(Nosek et al., 2015; Wilkinson et al., 2016). In this sense, OA not only broadens participation in scientific communication but also strengthens the credibility and integrity of knowledge production. As illustrated in Figure 2, Open Access facilitates transparency and reproducibility throughout the research cycle.

5.4 Accelerating Innovation and Societal Benefits

Beyond academia, Open Access operates as a catalyst for innovation and social progress. By dismantling financial and institutional barriers, it allows knowledge to circulate freely between researchers, industries, policymakers, and the public. This circulation accelerates the transformation of research outcomes into technological solutions and public policies. The increased visibility of Open Access publications often translates into higher citation impact and faster knowledge diffusion (Piwowar et al., 2018).More importantly, it democratizes access to scientific information, enabling equitable participation from developing regions and ensuring that the benefits of research extend to society as a whole(Chan et al., 2011). In essence, Open Access converts the outputs of scholarship into shared resources for collective advancement.

Figure 2. Open Research Lifecycle (adapted from University of Melbourne, 2023).



The figure 2 demonstrates how Open Access integrates data sharing, open methods, and peer review to enhance scientific transparency, reproducibility, and innovation, ultimately contributing to societal benefit.

6. Challenges and barriers to open access

Open Access offers significant opportunities for scientific communication, yet its implementation is accompanied by a range of challenges and barriers that must be acknowledged; The key challenges are summarized in Table 1:

Table 1. Key Challenges and Barriers of Open Access

Challenge	Description
Financial constraints and APCs	Open Access often requires authors to pay APCs to cover publishing costs. These fees can be prohibitively high for researchers from low- and middle-income countries or underfunded institutions, creating inequities in publishing opportunities(Suber, 2012).

Copyright, licensing, and intellectual property issues	Navigating copyright and licensing frameworks can be complex. Ambiguities in licensing terms or lack of institutional guidance can restrict lawful reuse, adaptation, and redistribution of research outputs, limiting the full benefits of Open Access (Kherouf & Boumarafi, 2025).
Institutional, cultural, and technical obstacles	Adoption of open access may be slowed by institutional resistance, entrenched cultural preferences for traditional publishing, limited awareness among researchers, and insufficient digital infrastructure. Technical issues include repository management and system interoperability challenges.
Predatory publishing and quality control concerns	The rise of predatory journals exploiting the APC model threatens the credibility of research. These journals often lack rigorous peer review or editorial standards, undermining trust in Open Access publications and potentially misleading authors and readers (Grudniewicz et al., 2019)

7.Global and Regional Perspectives

Open access initiatives have become essential tools for enhancing the visibility, accessibility, and impact of scholarly research. In this study, a selection of representative global and regional OA repositories and databases has been chosen to illustrate the current landscape:

7.1 Global Open Access Initiatives

- **Directory of Open Access Journals (DOAJ)**

Overview: DOAJ is a comprehensive, community-curated directory of high-quality, peer-reviewed open access journals across all disciplines. It provides an essential platform for global knowledge dissemination and supports equitable access to scholarly publications.

Website: https://doaj.org

- **HAL (Hyper Articles en Ligne)**

Overview: HAL is a multidisciplinary open archive where authors can deposit scholarly documents from all academic fields. Managed in France, it is part of the European OpenAIRE network, facilitating compliance with European OA mandates.

Website: https://hal.archives-ouvertes.fr

* **Zenodo**

Overview: Zenodo is an open-access repository developed under the European OpenAIRE program and operated by CERN. It allows researchers to deposit publications, datasets, software, and other research outputs, supporting reproducibility and open science.

Website: https://zenodo.org

* **Oxford University Open Access Repository**

Overview: Oxford University maintains its institutional repository to provide OA access to research outputs, theses, and publications authored by its researchers. It is part of the university's commitment to global knowledge sharing and scholarly communication.

Website: https://ora.ox.ac.uk

7.2 Regional Open Access Initiatives

* **Système National de Documentation en Ligne (SNDL)**

Overview: The SNDL is a national initiative managed by the Centre de Recherche en Informatique et Systèmes de Télécommunications (CERIST), aiming to provide Algerian researchers with free access to a wide range of national and international scientific resources.

Access and Registration: Researchers, doctoral students, and Master's level students can apply for access through their respective university's digital platforms.

Available Resources: The SNDL provides access to major international databases such as ScienceDirect, Scopus, SpringerLink, Wiley Online Library, and ClinicalKey, among others.

Website: https://www.sndl.cerist.dz

* **Algerian Scientific Journal Platform (ASJP)**

Overview: ASJP is an electronic publishing platform developed and managed by CERIST. It serves as a national repository for peer-reviewed Algerian scientific journals across various disciplines, primarily in Arabic, French, and English.

Purpose: The platform enhances the visibility and accessibility of Algerian research outputs and promotes scholarly communication within the country and internationally.

Website: https://asjp.cerist.dz

* **Institutional Repositories (DSpace-based)**

Overview: Many Algerian universities have implemented DSpace-based institutional repositories to collect, preserve, and disseminate research outputs of faculty, doctoral, and master's students. These repositories contribute to local OA infrastructure and support compliance with SNDL access policies.

Examples: These repositories host theses, dissertations, articles, and conference papers, providing searchable access to scholarly works produced within the national academic system. Notable examples include: University of Constantine 2 (Abdelhamid Mehri University), University of Algiers 2 (Abou El Kacem Saâdallah), University of Laghouat,University of M'hamed Bougara Boumerdes (FS UMBB)

8.Toward a Sustainable Open Access Future

Ensuring the long-term sustainability of open access has become a central priority in global scholarly communication, as institutions and publishers seek models that balance openness with economic and structural viability (Research information, 2021; Schlitzer, 2025).

- Achieving a sustainable open access (OA) future requires adopting innovative publishing models that provide free access to research without compromising fairness or financial stability.
- Models such as Subscribe to Open (S2O), community-funded publishing, and alternative financing mechanisms reduce reliance on APCs while maintaining quality and accessibility(Research information, 2021; Schlitzer, 2025).
- Long-term sustainability depends on global collaboration, efficient resource use, and the adaptation of models to regional research contexts and institutional capacities.
- Advancing OA sustainability involves developing new funding strategies, promoting openness and inclusivity, and ensuring continuous community engagement to democratize knowledge production and dissemination.
- The future of OA depends on continuous collaboration among researchers, institutions, funders, and publishers.
- Emphasis must be placed on transparent governance, creative funding mechanisms, and inclusive policies that reflect diverse global research ecosystems.
- Continued international initiatives and advocacy efforts highlight the societal impact and democratizing role of open access in advancing science.

Conclusion

Open Access has become a transformative force in scientific communication, redefining how knowledge is produced, shared, and reused. By ensuring free and immediate access to research, it promotes visibility, collaboration, and innovation across disciplines and borders. Yet, its implementation still faces obstacles such as funding inequities, predatory publishing, and uneven policy adoption, which challenge the fairness and sustainability of the system. Moving forward, achieving a balanced and inclusive OA ecosystem requires collective action through transparent governance, diversified funding models, and stronger institutional support. Ultimately, Open Access represents more than a publishing model; it

embodies a global commitment to make scientific knowledge a common good that advances research and benefits society as a whole.

Recommendations

To consolidate the role of Open Access in supporting scientific research, it is essential to:

- Develop national and institutional policies that ensure fair and sustainable OA publishing practices;
  – Encourage universities to invest in robust digital infrastructures and open repositories;
  – Promote researcher awareness and training on copyright, licensing, and ethical publishing standards.

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