Editorial Letter

A COMPREHENSIVE REVIEW OF OPEN ACCESS IN SCHOLARLY PUBLISHING

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Abstract: *This thorough review explores the landscape of open access (OA) in scholarly publishing, covering its origins, development, and current status. The study offers a deep understanding of OA, its paradigms, and how it differs from traditional subscription models. It delves into the advantages and downsides of OA publishing, highlighting variations across different academic disciplines and regions. The authors also analyzes current trends and possibilities for OA, emphasizing the importance of a comprehensive understanding for all stakeholders in scholarly publishing, including policymakers, publishers, research sponsors, governments, libraries, and intellectual societies. This is crucial for navigating the complex nature of OA and adapting to the changing landscape of academic communication.*

Key words: *open access, scholarly publishing, research dissemination, academic journals, scientific communication*

1. INTRODUCTION

Curcic (2023) reports that since 1996, there have been over 64 million academic journals worldwide, with a projected increase in this number. These publications cover a wide range of subjects and areas of study (Zul, 2023). The world of scholarly publishing, which has historically been defined by restricted access and limited distribution via subscription models, is now seeing a substantial shift propelled by the open access (OA) movement. According to Kim and Park's (2021) statistics, over 90% of the publications, which amount to over 2 million, are published globally annually as OA. Leading publishers, including Springer, Elsevier, Wiley, RSC, MDPI, BMC, PLoS, Frontiers, and Hindawi[1], produce over 10,000 OA publications annually. This shift significantly improves the ease of access to research, expedites scientific progress, and promotes international cooperation.

However, the transition to OA is not without its complexities, raising important issues regarding funding, scientific quality control of publications, and the potential impact on different disciplines. Through an analysis of its historical background, fundamental principles, and profound effects, we can acquire a deeper understanding of its pivotal role in transforming the distribution of knowledge. As a result, this review examines the benefits and difficulties associated with OA, including funding, quality control, and the impact on various stakeholders, such as legislators, publishers, study sponsors, governments, libraries, and intellectual societies. Understanding the concept of OA is essential for comprehending its impact on the future of scientific research dissemination

[1]In December 2023, Wiley Publishing, which acquired Hindawi in 2021, announced that it would stop using the Hindawi brand. The decision was made "to mitigate against systematic manipulation of the publishing process."

and publishing.

2. SCHOLARLY PUBLISHING ACTIVITY

2.1. A Brief Overview and the Commonly Used Related Terms

Scholarly publishing is critical for a faculty member's progress in an educational institution, spreading academic research to a broader academic community and the public. By producing scholarly output, an author asserts their intellectual primacy over initiative and creates a lasting mental record. Publication empowers the researcher to claim creative ownership of an idea and protects it from duplication by others. Additionally, it ensures the enduring conservation of academic concepts and discoveries for further application. It entails the dissemination of research results, articles, books, and other intellectual works via scientific journals, conference proceedings, etc.

According to Park and Shim (2011), as for its aims, "scholarly publishing plays a critical role in promotion, tenure, scholarly recognition, and certification of research quality at academic institutions." In fact, it is essential for the advancement of knowledge, the sharing of research achievements, and the promotion of academic discussion and cooperation across different areas of study. Publishers and journals typically use a peer-review procedure to ensure the quality and validity of the published study (Elsevier, 2024; Wiley, 2024a).

These days, the Internet has brought about a significant transformation in scholarly communication and publication methods within the global academic community. The advent of digital transformation has not only revolutionized research dissemination, but it has also facilitated the emergence of novel modes of academic writing and collaboration. This shift has gradually replaced conventional print-based publications with electronic platforms (Robert, 1999).

A prominent aspect of academic publishing involves the provision of the ***International Standard Serial Number (ISSN)*** to academic journals and the I***nternational Standard Book Number (ISBN)*** to books and other scholarly publications. ISSN and ISBN are distinct alphanumeric identifiers that facilitate the identification and monitoring of journals and books in the academic publishing realm, thereby simplifying information management and retrieval (ALA, 2022). Besides, a ***Digital Object Identifier (DOI)*** is a widely accepted standard for uniquely and permanently identifying and connecting online material on the Internet. The International DOI Foundation serves as a registration agency, responsible for assigning and managing these alphanumeric strings, thereby creating a unique identifier for each online document. Since 2000, the International DOI Foundation has been developing this system (Morris, 1998; Surprenant, Blake, & Warwick, 1998; Schroeder, 1998; Simmonds, 1999; Mooney, 2001, as cited in Gorraiz et al., 2016). Using DOIs in citations provides more reliable connections to referenced works and has the potential to decrease the occurrence of broken links in academic writing (Gorraiz et al., 2016). Crossref is a non-profit organization that operates the DOI registration agency for scientific publications, holding a leading position in this field. In collaboration with publishers, Crossref is responsible for assigning DOI numbers to documents and verifying the accuracy and currency of the information linked to each DOI number (Crossref, 2021).

In the 1960s and 1970s, the advent of information technology and computers led to the digitization of bibliographic databases (DBs), resulting in quicker and more convenient access to and retrieval of information. Imagine DBs as a gigantic digital library that houses vast amounts of information on numerous scientific publications. This encompasses details like author names, abstracts, and the frequency at which other studies reference the work.

Researchers extensively use this information to evaluate the quality of research, rank universities, and determine research funding. Globally, researchers have created numerous bibliographic databases encompassing various disciplines such as the natural sciences, social sciences, humanities, and arts. Frequently employed databases include PubMed, Web of Science, Scopus, and Google Scholar. These databases include four key research metrics: (1) number of publications; (2) citations[2]; (3) h-index[3]; and (4) annual h-index[4] (Patra, 2017).

One of the first bibliographic databases in the electronic field was ***PubMed***, developed by the National Library of Medicine (USA) in 1997 (National Library of Medicine, 1997). Eugene Garfield established the ***Institute for Scientific Information (ISI)*** and later developed the Web of Knowledge platform, which gradually underwent changes and eventually acquired its present designation, ***Web of Science***, commonly abbreviated as WoS (Pranckut, 2021). ISI also created the Science Citation Index (SCI) in 1964 (Haddow, 2018). In addition to contributing to the ***WoS***, ISI has several prominent tools such as journal citation reports for evaluating scientific production. Every year, this tool updates the ***Journal Impact Factor (JIF)*** of all indexed journals. The next database is ***SCOPUS*** of Elsevier, with roughly 21,500 publications, 131,000 books, and over 7.5 million conference proceedings in its index (Ayman, 2019). The SCOPUS database also employs its own metric for assessing influence, known as ***CiteScore***, which is designed to rival JIF (Trịnh Thị Phương Thảo et. al., 2019). Google Inc. introduced Google Scholar, an extensively acknowledged and commonly used academic search engine, in 2004 (Gusenbauer, 2019). Google Scholar provides a thorough and cost-free search engine, enabling users to easily locate and retrieve scholarly information (Noruzi, 2005).

To evaluate the scientific quality of scholars' work, the two databases, WoS and SCOPUS, use ***quartile ranking*** as a criterion. Quartile ranking is a method of ranking the best journals based on their research output and disciplinary value. Generally, experts recommend submitting research articles to journals ranked in the WoS or SCOPUS quartile because of their recognition in the author's field. Journals determine their quartile rankings based on citations and reputation in each category (for instance, the Journal Impact Factor ranking determines the WoS quartile rankings, while CiteScore is used to evaluate SCOPUS). Therefore, we classify the top 25% of scientific journals in any field as ***Q1*** journals, which are the highest-quality publications that provide valuable insights and receive significant citations. ns. Following them, the 25–50% group falls into the ***Q2*** category, encompassing journals that provide detailed viewpoints on a range of subjects. ***Q3*** journals, accounting for 50-75% of the rankings, specialize in specific topics and provide a specific research perspective. Lastly, the remaining 75–100% are considered ***Q4*** journals, often utilized by new authors. Based on individual expertise and subject, scholars can choose a quartile ranking to publish their scientific research paper (Clarivate, 2022).

2.2. The Cost of Scholarly Publishing and the Traditional Publishing Model

It is important to note that maintaining academic publishing activities in scientific journals to be effective, continuous, and sustainable over time is a very difficult and expensive task. For example, the Massachusetts Medical Society owns and publishes ***the New England Journal of Medicine (NEJM)***, a

[2] The total number of times an author's publications are cited reflects the influence and importance of their research work (Patra, 2017).

[3] A h-index is a numerical indicator that represents a scholar's accomplishment of publishing a minimum of 'h' publications, each of which has received at least 'h' citations (Hirsch, 2005)

[4] An annual h-index helps users evaluate research performance over a specific period of time (Patra, 2017)

prestigious and long-standing journal known as the "bible of medicine." Founded in 1812, NEJM continues to thrive today, publishing 52 issues weekly (The New England Journal of Medicine, 2024). Similarly, the American Physical Society founded ***Physical Review Letters (PRL)*** in 1958, making it the most prestigious journal in the field of physics with numerous publications that have won the ***Nobel Prize in Physics*** (American Physical Society, 2024). To maintain their operations and prestige, both of these journals require a large budget from their publishers.

Typically, a publisher's scholarly publishing costs include journal development, commissioning content, manuscript processing, peer review administration, editing and proofreading, typesetting and formatting, distribution and promotion, online platform hosting and maintenance, software and tool licensing and subscription fees, marketing and advertising costs, customer service, as well as staff salaries and overhead (Nature, 2020; RSC, 2024). These costs can add up quickly and have a significant impact on a publisher's overall budget. This issue, however, raises the important question of who pays for these costs.

To address the above question, the subscription-based model was adopted and is still widely used today. The subscription-based model in scholarly publishing refers to requiring individuals or organizations, such as universities and research institutes, to pay a fee to access academic research and publications. The scholarly publishing industry has traditionally adopted this model, charging readers fees to access content through individual article purchases, journal subscriptions, or purchase access to database collections. This model is a source of revenue that allows publishers to cover the costs of proofreading, editing, and disseminating research. However, these fees can be quite expensive, especially for organizations with limited budgets. As a result, the model has faced mounting criticism for limiting access to valuable research and knowledge, particularly for those who cannot afford it.

3. OPEN ACCESS IN SCHOLARLY PUBLISHING

3.1 Open Access Concepts

Subscription-based models dominated scientific publishing in the late 19th and early 20th centuries, but they began to face more challenges. As more scholars and institutions emerged, the cost of accessing scientific publications became too high for many researchers and the general public. This led to the start of the early 2000s Open Access (OA) movement, which focused on making research more accessible and affordable and sharing findings more broadly. The OA movement closely links to the growth of the internet, facilitating universal access to information.

OA refers to the process of providing academic information to the public without any restrictions, such as financial, legal, or technological obstacles. This approach is different from the traditional way of accessing research, where people need to pay for subscriptions to journals or individual articles. This means that only those who can afford to pay can access the research. Peter Suber, a strong advocate for the OA movement, defines it as the ability for anyone with internet access to freely read, download, and share research publications (Suber, 2012). The Budapest Open Access Initiative (2002) defines OA as making research results freely available on the internet without restrictions. It emphasizes that Open Access allows anyone to freely access, download, copy, distribute, print, search, or link to the full text of these publications. OA increases author visibility and access to research papers, resulting in faster scientific progress and improved international collaboration.

Traditional academic publishing often restricts access to research behind expensive paywalls, charging fees to individual readers or their institutions. The OA model

transfers these costs to researchers who submit their scientific work to OA journals via ***article processing charges (APCs)***. Essentially, governments or research funding organizations source these costs, directly supporting scientists in their research projects. In other words, a portion of the funding already includes open access publishing. These fees, paid upon manuscript acceptance, cover a range of publishing services.

After discussing the OA concepts, we explore the practical application of licensing frameworks for this type. Creative Commons (2023) asserts that the shared objective of fostering broader dissemination and availability of knowledge intricately links OA to ***Creative Commons (CC)*** licenses. Creative Commons licenses provide a uniform standard for individuals and organizations to authorize the public to use their creative work within the limits of copyright regulations. Creative Commons has six primary license categories, each accompanied by its own specific set of authorizations and limitations.

• ***CC BY (Attribution)*** license provides permission to use, duplicate, share, and adapt the work on the condition that the user acknowledges the original authors. Self - archived papers often utilize this license.

• ***CC BY-NC (Attribution - NonCommercial)*** license is comparable to the CC BY license, but it explicitly forbids any form of commercial use.

• ***CC BY-SA (Attribution-ShareAlike)*** requires that others share their new creations under the same license terms in exchange for the rights mentioned on the CC BY license.

• ***CC BY-NC-SA (Attribution - NonCommercial-ShareAlike)*** is similar to CC BY-NC, but it also requires that others share their new creations under the same license terms.

• ***CC BY-ND (Attribution - NoDerivatives)*** allows others to use and share your work, but they cannot adapt or modify it in any way.

• ***CC0 (No rights reserved)*** offers full freedom from copyright and associated rights, enabling people to access your work without any limitations or obligations for acknowledgment.

3.2 Paradigms of Open Access Publication

Suber's Open Access (2012) provides a comprehensive overview of several categories of OA publication modes, including ***Gold OA*** (publishing in OA journals), ***Green OA*** (self-archiving in repositories), and ***Hybrid OA*** (OA articles in subscription journals). Besides, ***Bronze OA*** was first proposed by Piwowar et al. (2018), or ***Diamond OA*** exemplified by ***Scipost*** journals (Scipost, 2024).

3.2.1 Gold Open Access

Gold OA refers to papers that are readily accessible to the public without any restrictions as soon as they are published. These papers are usually published in journals that follow an OA model, where the expenses are funded through APCs paid by authors or their institutions, or by other means of financial support. For example, the publishers, including MDPI, BMC, PLoS, Frontiers, and Hindawi, contribute a larger share of these publications in the gold OA format.

3.2.2 Green Open Access

The practice of authors freely sharing their work by depositing it in repositories, such as institutional or subject-specific libraries, after publication in a journal that requires a subscription is known as ***Green OA***. Authors need to understand how to use repository platforms, including techniques for uploading documents, filling in information, and being aware of the copyright terms of the journal where the work is published, to ensure that self-archiving does not violate any regulations. Journals may permit authors to self-archive manuscripts, preprints, and published articles, but they might impose an ***embargo period*** before allowing them to publicly share a copy on the repository. There are specialized repositories for specific fields,

such as ***bioRxiv*** for biology and ***SSRN*** for social sciences.

3.2.3 Hybrid Open Access

The system operates based on a ***hybrid OA*** model, providing authors with flexibility in choosing their publishing method. For instance, authors submitting research articles to Nature can choose between two publishing models: the traditional subscription model, which allows readers to access articles through subscriptions or individual purchases, and the Gold OA model, where authors or their funders pay an article processing charge (APC) to make the article freely accessible to everyone (Nature, 2020). Publisher Wiley also offers authors options in how they wish to publish their research while supporting the transition from traditional publishing to OA (Wiley, 2024b).

Gold OA grants unrestricted access to all research publications, whereas Hybrid OA only offers free access to specific OA articles within a journal that primarily operates under the traditional access paradigm. Hybrid OA offers authors a more adaptable choice, but it has faced criticism for engaging in "double dipping" by charging both authors (via APC) and readers (through membership fees) for the same publication.

3.2.4 Bronze Open Access

Bronze OA pertains to papers that are freely accessible to readers, as provided by publishers, without any explicit reference to an OA license. According to Garcia, Costas, and Leeuwen (2020), this OA publication fails to meet the copyright requirements necessary for its classification as OA, thereby not ensuring perpetual free access. Consider the example of ***arXiv.org*** for Bronze OA, where researchers self-archive preprints in a freely accessible repository.

Green OA and Bronze OA may seem similar in that both allow people to read articles for free. The key difference is that Green OA encourages researchers to self-archive their articles and usually has explicit permission from publishers or journals to reuse the content. IOn the other hands, Bronze OA is where authors self-upload without going through a review process, so the reuse of information may be limited. In other words, Green OA is a reliable, long-lasting, and high-standard paradigm, whereas Bronze OA is an informal method of sharing with restrictions on quality and authenticity.

3.2.5 Diamond Open Access

Diamond OA, also known as ***Platinum OA***, is a publishing model that waives fees for both the publication process and material access for writers and readers. Institutions, research consortia, or government funding typically support this model. Diamond OA publications do not impose APCs, which enhances fairness, particularly for researchers hailing from economically disadvantaged areas. ***SciPost*** and ***the Open Library of Humanitie***s are two examples of Diamond OA platforms. Academic institutions and organizations oversee the SciPost journals and provide complete financial support. This guarantees that there are no expenses for authors or readers (Scipost, 2024).

3.3 Distribution of OA paradigms

Garcia, Costas, and Leeuwen (2020) conducted an analysis on different publication records, focusing on the OA availability of research outputs from 963 universities worldwide. The analysis recognized 1,881,193 out of the 4,620,666 published records as OA. Table 1 and Fig. 1 present the distribution of OA publications classified into various categories. The number of green OA articles was 1,479,111, followed by 623,577 gold OA, 374,867 bronze OA, and 301,758 hybrid OA publications. Nevertheless, there is a significant overlap between each of these aforementioned forms of OA and green OA. 45% of Bronze OA are also available in green OA, while for hybrid publications, the proportion that is also green OA is 63%. As for gold OA, 81% of all gold OA papers fall into this category.

Table 1: OA Publication Distribution by Paradigm (Garcia, Costas & Leeuwen, 2020).

OA Paradigm	Number of Publications	Percentage of Total OA (%)	Overlap with Green OA (%)
Green OA	1,479,111	77	-
Gold OA	623,577	33	81
Bronze OA	374,867	20	45
Hybrid OA	301,758	16	63

Note: The "Overlap with Green OA" column displays the proportion of each OA type that falls under the Green OA classification.

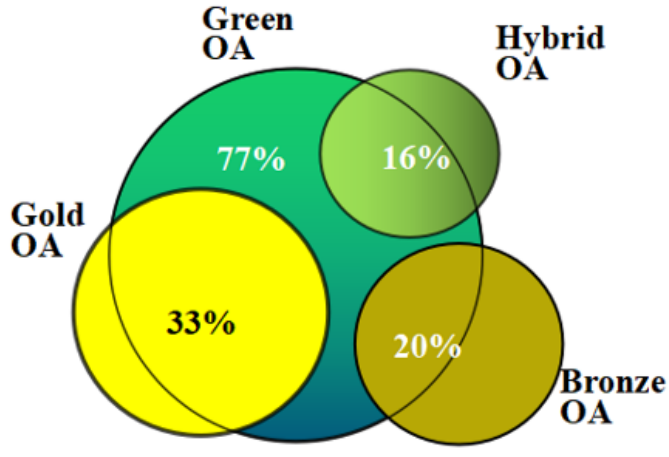


Figure 1. OA Paradigm Distribution Breakdown (Garcia, Costas & Leeuwen, 2020)

There is a significant rise in the quantity of articles published in Gold OA journals, escalating from 340,130 in 2011 to 834,134 in 2018, denoting a 145% surge over the span of 8 years (Garcia, Costas & Leeuwen, 2020).

3.4 The Evolution of Open Access Publishing

The late 19th and early 20th centuries saw a notable surge in the number of scholars and academic institutions, resulting in regulations in the scientific publishing landscape. Fyfe et al. (2017) assert that until the early 1960s, the conventional paradigm primarily relied on reader subscriptions; academic institutions released most scientific journals, while individuals and organizations purchased subscriptions for access to print and, subsequently, digital editions of publications (Suber, 2012). Scientific journals were most often subscribed to by universities, research institutes, and libraries. Scientists, researchers, and other interested users have the option to purchase personal journal subscriptions, which are typically more expensive than institutional subscriptions (Tenopir & King, 2000). Non-subscribers had the option to buy individual items separately, typically at expensive rates (Björk & Solomon, 2013). It is important to acknowledge that the scientific publishing industry has undergone significant changes in recent years due to the emergence of new publishing models and digital distribution. Nevertheless, numerous conventional means of accessing information persist alongside contemporary, more inclusive methods of sharing scientific knowledge.

In the aftermath, the OA movement gained traction in the early 2000s due to increasing expenses and restricted availability of traditional publishing (Budapest Open Access Initiative, 2002), and the OA scholarly publishing trend was inherently connected to the growth of the Internet (Laakso et al., 2011). The timing of this occurrence was not accidental, as the Internet provided the

necessary framework for OA to become viable. According to Noorden (2014), Paul Ginsparg's 1991 founding of ***arXiv.org***, widely regarded as a groundbreaking initiative in the open distribution of research, marked the origin of OA. However, publishing in OA journals faces many challenges, primarily related to copyright disputes and the quality of articles. The subsequent decade saw a significant increase in OA journals, exemplified by the launch of the Directory of ***Open Access Journals (DOAJ)*** in 2003 (Björk, 2011). Funding agencies and organizations began requiring researchers to publish their research findings in open access journals in the 2010s (Larivière et al., 2018).

The movement accelerated further with initiatives like Plan S in 2018, which aimed for full and immediate OA (Else, 2018). Most recently, the COVID-19 pandemic has demonstrated the importance of sharing research quickly and openly, leading to increased support for OA (Tavernier, 2020). This progression reflects a fundamental shift in trend of scholarly communication, emphasizing accessibility, transparency, and the democratization of knowledge. In 2023, Gold OA published 38% of all worldwide journal articles, reviews, and conference papers, or approximately 12.54 million papers, as Versions of Record, making them instantly available and publicly accessible (STM Association, 2024).

The evolution of the "author pays" model in Open Access (OA) publishing, particularly through the widespread adoption of Article Processing Charges (APCs), has led to significant challenges in the academic publishing landscape. "Predatory publishers/ journals," who prioritize profit over academic integrity and offer little to no peer review or editorial oversight, have exploited this model, initially intended to support unrestricted access to scholarly work (Beall, 2012). This deviation from the original philosophy of OA represents a troubling turn in the evolution of scholarly communication. Furthermore, the emergence of "fake journals,"often based in countries such as India, Bangladesh, and Pakistan, charge minimal APCs and provide inadequate academic scrutiny, leading to the proliferation of substandard research (Shen & Björk, 2015). These low-cost publication options, often predatory journals or fake journals, attract researchers from developing countries where funding for research is often limited. This development is a malignant mutation of the OA model, and addressing it is crucial to preserving the integrity of academic publishing.

3.5 Positive and negative aspects of the Open Access publishing models

3.5.1 Positive Aspects of Open-Access Publishing Models

a. Advanced, swift availability, and cooperation

OA significantly enhances the accessibility of scholarly research by removing obstacles such as subscription costs and APCs, allowing free access to research findings for anyone with an Internet connection. This technique promotes equitable access to information, enabling broader dissemination of research among diverse institutions and geographical regions (Suber, 2012). Conversely, traditional publishing methods might often restrict access to only those who are subscribers or have the financial resources to buy journal subscriptions or individual publications. The limited accessibility of information may present challenges for researchers and the general public, particularly scientists or organizations with limited budgets. By promptly making articles available to the public after publication, OA facilitates the swift dissemination of research findings. This timeliness can accelerate the dissemination of ideas and drive scientific progress (Budapest Open Access Initiative, 2002). Moreover, OA facilitates global collaboration by offering unfettered access to scholars from many institutions, especially those with modest financial resources, to engage in and

contribute to global scientific discourse by removing barriers to access (Suber, 2012).

b. *Improved visibility and increased influence*

OA publications typically have greater visibility and impact because they are readily available to everyone without charge. Studies show that OA papers receive more reads and citations than those accessed through paywalls. This heightened exposure and influence can potentially lead to greater recognition and impact within the academic community (Piwowar et al., 2018). In contrast to research articles published in subscription-based journals, OA papers may have improved visibility, readership, and citations. Open access journals publish articles that are easier to find, attract a larger readership, and receive more citations than subscription-based journals. This means that open-access articles are better known and have a greater impact within the academic community. In contrast, articles in subscription-based journals may have limited visibility and influence. When a journal's discoverability decreases, it can affect its impact factor and standing within the academic community (Elsevier, 2021).

3.5.2 Negative Aspects of Open Access

a. *APCs Barriers*

The reliance of OA on APCs paid by authors or their institutions is a significant challenge. The application of these fees can create a substantial financial burden and may hinder the ability of researchers who lack sufficient financial resources to publish high-quality scientific work in prestigious publishers or journals (Piwowar et al., 2018).

b. *Quality Concerns*

There are also acknowledged problems, such as the possible financial burden of APCs and apprehensions over the quality of some OA journals (Piwowar et al., 2018). The emergence of OA has unquestionably democratized scientific publishing, facilitating wider access to research and promoting international collaboration. Nevertheless, this change has also exposed a troubling problem: the rise of ***"predatory publishers/journals."*** These publishers and journals, which frequently engage in unethical behaviors and misuse the OA paradigm for monetary advantage, pose a risk to the credibility of published research. These journals, sometimes even demanding upfront payments for "processing" or "publication fees," lack stringent peer-review procedures or just formalize cursory peer review. As a result, they may disseminate substandard or fraudulent research, which could compromise the integrity of the scientific literature. The proliferation of predatory journals has eroded trust in the OA system. This can make it difficult for researchers to distinguish between reputable OA and predatory journals, leading to wasted time and resources (Anderson, 2023). A researcher's credibility may suffer if they submit an article to a predatory publisher, especially if the study proves to be untrustworthy. Researchers may incur financial losses as a result of paying publishing fees for works that ultimately do not get indexed in a database or cited.

c. *Challenges related to financial support and long-term viability*

An important issue pertaining to the enduring maintenance and stability of OA publications is that OA journals, especially those operating on a smaller scale or dependent on APCs, may encounter difficulties in guaranteeing long-term existence, unlike traditional subscription-based journals that typically have established infrastructure and financial support from large publishers. This can lead to a significant number of OA publishers' closures, leaving articles inaccessible after a certain period.

3.6 Disparities in Open Access publishing across disciplines and different regions

The landscape of OA publication varies significantly among different academic fields, ranging from the social-economic sciences

to the natural sciences. This section delves into the disparities in OA publishing procedures across disciplines, examining factors such as the number of journals and publishers in two decades from 2000 to 2019, geographical features, and other relevant aspects.

3.6.1 Disparities in Open Access publishing across disciplines

Table 2 provides a detailed distribution of OA journals by discipline between 2000 and 2019, revealing the varying levels of OA adoption across different fields.

Table 2. Distribution of OA Journals by Discipline between 2000 and 2019 (extracted from Kim and Park, 2021)

Disciplines	2000	2010	2019
Social sciences	5.6%	10.4%	19.9%
Arts and humanities	4.8%	8.3%	17.6%
Business, management, and accounting	2.5%	5.6%	12.4%
Economics	2.8%	3.0%	17.3%
Psychology	2.2%	8.5%	15.6%
Neuroscience	20.5%	20.5%	26.5%
Physics and astronomy	8.8%	8.8%	14.1%
Engineering	4.6%	4.6%	11.9%
Computer science	4.1%	2.6%	9.2%
Total	**4.3%**	**6.4%**	**15.5%**

To further illuminate these trends, a bar chart has been constructed to visually represent the data, allowing for a comparative analysis of OA journal prevalence and growth over time. The bar chart (Fig. 2) depicts the trend in OA publishing across various academic disciplines in three different years. Each bar represents a different discipline, and its length correlates with the percentage of OA publications within that discipline for the given year. The use of solid colors signifies social scientific subjects, while patterned hues symbolize natural science fields.

Overall, the trend indicates a significant increase in OA publishing across disciplines over time, with the nature disciplines generally exhibiting a higher adoption rate compared to the economic-social disciplines during the 2000–2019 period.

In 2000, the overall proportion of OA publication in economic-social disciplines was quite low; for instance, psychology had a 2.2% OA publishing rate. In 2019, there was a substantial increase in these figures, with social sciences rising from 5.6% in 2000 to 19.9% and psychology rising to 15.6% after twenty years. Nature disciplines, on the other hand, had a higher starting point for OA publication compared to economic-social fields. For example, the percentage of neuroscience in 2000 and 2010 was 20.5% and increased to 26.5% by 2019. The proportion of physics and astronomy increased nearly twofold from 8.8% in the first ten years of the period to 14.1% in 2019, demonstrating the field's swift adjustment to OA publication. Computer science started at 4.1% before decreasing to 2.6% ten years later and increasing to 9.2% in 2019, showing a relatively large fluctuation compared to other natural sciences disciplines.

3.6.2 Disparities in Open Access publishing across different regions

Figure 3 presents the geographical distribution of OA papers across three reference years and nine aforementioned academic fields. There is a consistent rising trend in all categories, which suggests a growing acceptance of OA publications. Latin America leads the way with consistently high

OA adoption (87% by 2019), while Africa shows the most rapid growth (from 52% in 2000 to 78% by 2019). The Middle East also exhibits a steady increase. Eastern Europe and Asia show moderate but positive trends, while Western Europe and North America demonstrate slower adoption, albeit with consistent growth. Overall, the data indicates a global shift towards OA publishing, though the rate of adoption varies across different regions.

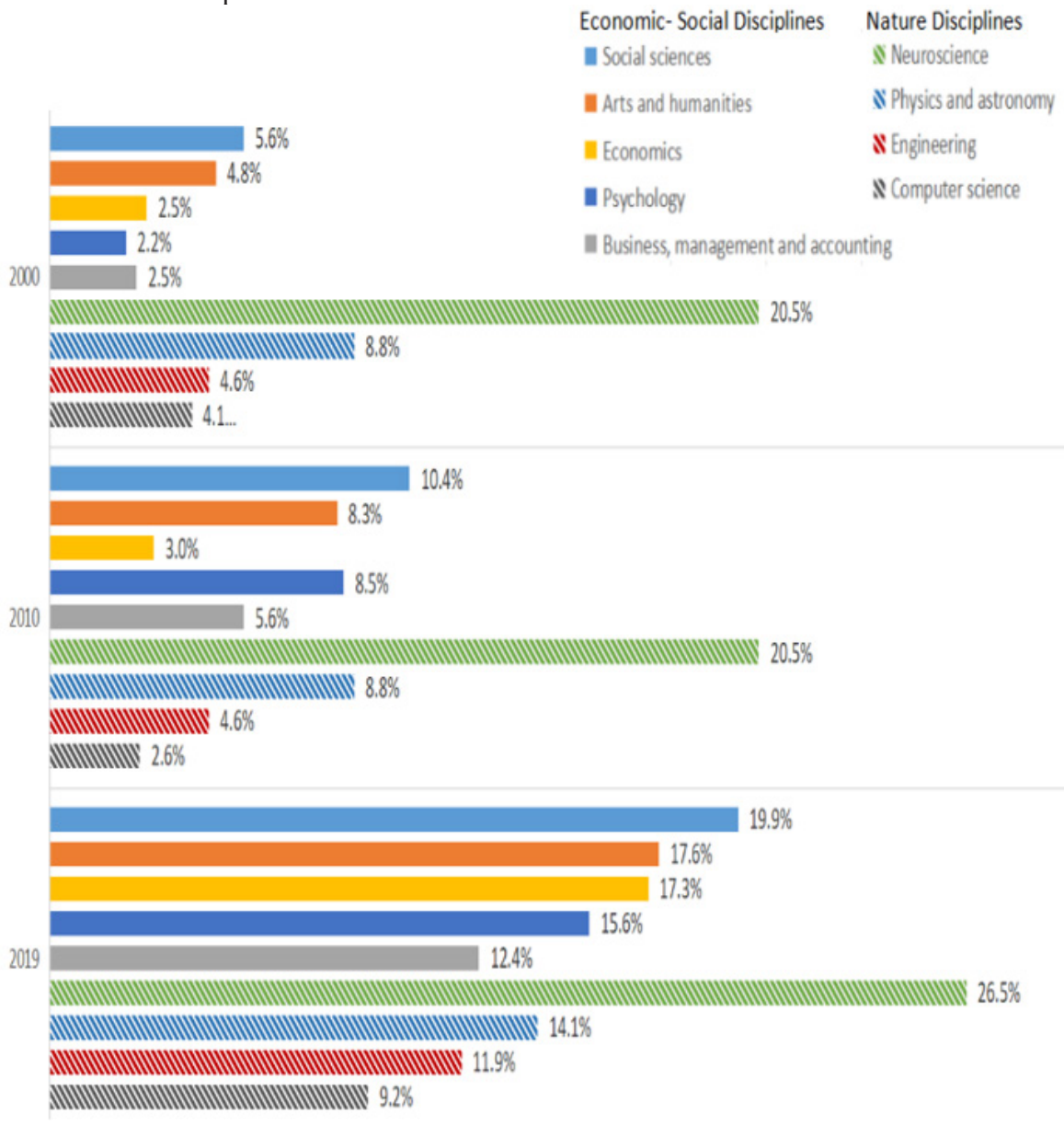
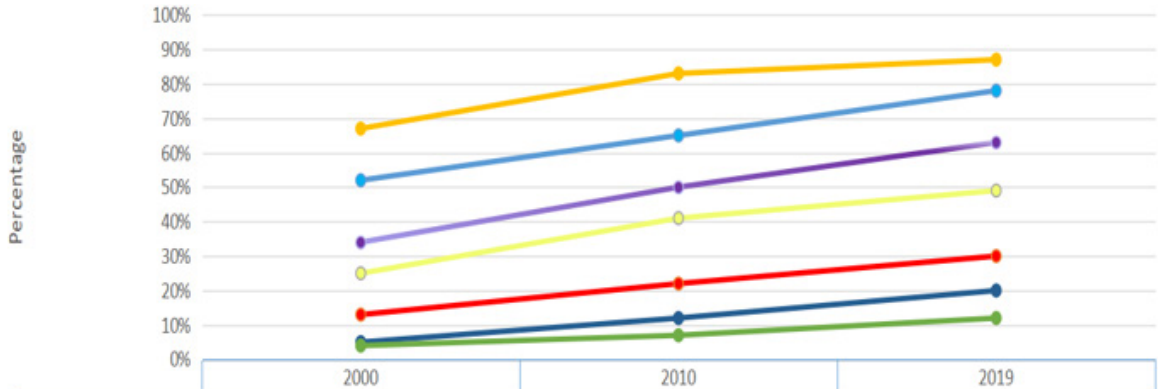


Figure 2. Trends in OA Publishing by Disciplines (2000–2019)

4. THE CURRENT TRENDS AND FUTURE OUTLOOK OF OPEN ACCESS

A growing number of universities are now making doctorate dissertations available in electronic form, and many of them have established arrangements with their publishing providers to assure prompt publication in institutional repositories. Publication agreements enhance the visibility and competitiveness of researchers (Cordón-García et al., 2013). Many funding organizations now require that research they support must be published in an OA format to ensure that the results are accessible to the public (Piwowar et al., 2018). This criterion aligns with the goal of maximizing the dissemination and spreading the influence



	2000	2010	2019
LATIN AMERICA	67%	83%	87%
AFRICA	52%	65%	78%
MIDDLE EAST	34%	50%	63%
EASTERN EU	25%	41%	49%
ASIA	13%	22%	30%
WESTERN EUROPE	5%	12%	20%
NORTH AMERICA	4%	7%	12%

Figure 3. The overall breakdown of OA papers in different global areas from 2000 to 2019 (extracted from Kim and Park, 2021)

of publicly funded research. Traditional publishing methods frequently fall short in achieving these goals, thereby affecting researchers' competitive ability to get future funding or comply with grant requirements (Suber, 2012).

In recent years, there has been a notable change in the funding and dissemination of academic research, specifically in terms of publishing fees. The fees for prestigious international publications and conferences might be exorbitant (Laakso & Björk, 2012). This has posed a hindrance for scientists and research institutes in nations with minimal resources. In order to ensure widespread availability of scientific research, several organizations, such as research institutes, educational institutions, enterprises, and sponsors, have created funds to provide financial support for the publication fees of OA journals.

Academic funding organizations in Vietnam are actively encouraging both fundamental and applied scientific research, with a specific focus on fostering the development of young researchers. Apart from prominent domestic organizations, including ***NAFOSTED (National Foundation for Science and Technology Development)*** and ***VAST (Vietnam Academy of Science and Technology)***, there are also foreign funding sources, such as the ***Newton Fund (UK), the Aus4Innovation Fund (Australia), the Japan International Cooperation Agency (JICA - Japan)***, and ***Marie Skłodowska-Curie Actions (EU)***. One approach they are using is to offer funds to defray the APCs associated with publishing research findings in prestigious journals. Vương Quân Hoàng (2019) states that numerous Vietnamese institutions have established incentive programs for international publications, specifically those that are indexed in WoS and SCOPUS. Ho Manh Tung et. al. (2021) stated that while some institutional rewards exceed the usual APC cost, others provide a portion, leaving authors to cover the remainder.

Numerous respected academic journals and publishers have established programs to provide assistance to researchers from economically disadvantaged, war-affected, or disaster-prone nations or those focusing on significant subjects, particularly in times of worldwide emergencies. These policies frequently incorporate waivers or reductions in APCs. For example, Research4Life, a

public-private partnership between United Nations organizations, offers institutions the opportunity to enhance the quality of education and scientific investigation in the fields of health, agriculture, the environment, and various other disciplines (Research4Life, 2023). PLOS (2023) also announces that "publication in any PLOS journal is free for authors whose research is funded primarily (50% or more of the work contained within the article) by an institution located in Research4Life Group A countries," while the publication price for all other journals will be decreased to $800 for Research4Life Group B countries, including Vietnam. In exceptional circumstances, such as the recent COVID-19 pandemic, a number of publishers, including Springer Nature, the New England Journal of Medicine, Elsevier, and Wiley, issued temporary waivers of APCs. These waivers aimed to support researchers and facilitate the dissemination of crucial pandemic-related information.

Another notable point is that academic publishers and some lawmakers are opposing the Nelson Memo, a White House directive that mandates the immediate wide availability of government-funded research. They are concerned that this move will impact copyright, disrupt the publishing industry, and cause financial harm to the $19 billion academic publishing industry. However, the Nelson Memo is also receiving support from advocates of TCM rights and libraries. Expected to take effect in 2026, the Nelson Memo will eliminate the current 12-month embargo period[4] after the completion of a study dissemination (Palmer, 2024).

Notably, an alarming trend is the conversion of formerly reputable OA publications into predatory ones after a few years of operation. These journals often start by following strict peer-review procedures and upholding ethical publication norms in order to build reputations and recruit contributors. Over time, it is possible that they will begin to prioritize maximising profits over maintaining high standards of quality and integrity. This could lead to a decline in standards and damage to the scientific community. Wiley acquired Hindawi, an OA publisher, in 2021, providing a pertinent example. While Hindawi initially gained recognition for its commitment to OA and rigorous peer review, concerns regarding its publishing practices emerged in recent years. Investigations revealed instances of compromised peer review, including the manipulation of the editorial process and the acceptance of low-quality articles. This ultimately led to Wiley's decision to stop using the Hindawi brand (Wiley & Sons, 2021) and shut down its 19 academic journals due to an issue with AI "paper mills", using AI technology to write articles and create inaccurate illustrations from a scientific standpoint, and integrity violations (Claburn, 2024).

The transformation of a publication from respectable to pre-predatory could perplex the assessment of earlier-published content. Being published in a publication that subsequently becomes predatory may have an influence on a scientist's reputation, however the degree of damage depends on many factors. When a researcher published their findings in a prestigious publication without knowing about its later downfall, the scientific community frequently considers this historical situation with sympathy.

5. CONCLUSION

Shaw and Barker (2023) discussed how OA publishing, once perceived as a specialized activity that faced opposition from several researchers, has now gained widespread acceptance as a routine component of the research process. Researchers are increasingly opting to publish OA articles due to their personal interest, rather than feeling compelled to do so, suggesting a growing

[4]Current 12-month embargo period allows publishers to choose not to make government-funded research publications publicly available for a year

trend towards positive involvement.

It is critical to keep in mind that not all OA journals are predatory journals with poor scientific quality. Many OA journals are reputable and contribute significantly to the scientific community. Researchers may protect themselves and improve the reliability of scientific papers by recognizing the challenges posed by predatory journals and opting for reputable OA publishers. When submitting a research manuscript, authors should minimize any harm to their scientific reputations by distancing themselves from these journals and publishers and persisting in publishing their work through trustworthy channels. Engaging in proactive transparency on the problem can lead to rewards down the road.

OA's actual measure is its concrete influence on the world. OA should result in research that clearly enhances the quality of people's lives and actively tackles the urgent challenges that our planet is experiencing. While it is crucial to make high-quality research accessible without charge, this action alone is not enough. We should insist that OA enables scholars to have a significant impact, promoting creativity and eventually constructing a more promising future for the academic world.

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