The Open Era, From Conception to Implementation: The Evolutionary Development and Practical Pathways of Plan S and OA Activities, Postprint

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Date: 2023-03-24T00:00:00+00:00

Abstract

The momentum of global development is imperative, and this trend has similarly extended to the academic sphere, where concepts of scientific globalization perspective and knowledge sharing are frequently invoked. OA publishing has become a central topic that cannot be ignored in academic circles. However, the current academic publishing ecosystem in our country remains in a confused, difficult, and stagnant initial exploration phase within the international OA trend. As the global open access movement gradually reaches a critical juncture, domestic academic institutions should also monitor developments in international academic publishing, promptly absorb and draw upon relevant commercial experience in journal management and publishing operations, thereby maintaining dynamic equilibrium within the academic publishing ecosystem, constructing a high-quality research system and paper publishing mechanism, and achieving benign sustainable development through continuous optimization. Simultaneously, this would lower the access barriers to academic papers and research outcomes, promote the equitable sharing and dissemination of academic resources, enable knowledge to transition from closed to open, and thereby effectively foster the formation of a scientific community under a global perspective.

Full Text

Preamble

From Concept to Implementation in the Open Access Era: The Evolution and Practice of Plan S and OA Initiatives

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Abstract

The tide of globalization is irreversible, and this trend has extended into the academic sphere, where the concepts of scientific globalization and knowledge sharing are frequently discussed. Open Access (OA) publishing has become a central topic that cannot be ignored in the academic community. Currently, China's academic publishing industry remains in a confused and difficult exploratory stage amidst international OA trends. As the global movement toward open access gradually reaches a critical juncture, domestic academic institutions should pay attention to developments in international academic publishing, promptly absorbing and drawing upon relevant business experiences in journal management and publishing operations. This will help maintain dynamic equilibrium within the academic publishing ecosystem, construct a high-quality research system and paper publishing mechanism, and achieve sustainable development through continuous optimization. Simultaneously, it can lower the barriers to accessing academic papers and research findings, promote the indiscriminate sharing and dissemination of academic resources, enable knowledge to transition from closed to open, and effectively advance the formation of a global scientific community.

Keywords: Open Access; digital publishing; open science; knowledge sharing

1. Introduction and Research Background

In November 2021, UNESCO's General Conference adopted the *Recommendation on Open Science*, marking a new phase of global consensus on the concept of open science. The Recommendation defines shared values, principles, and standards for open science at the international level and proposes a series of actions to facilitate equitable implementation of open science for all at individual, institutional, national, regional, and international levels. As an important component of open science, academic publishing has naturally garnered attention from international organizations and major academic publishers. Discussions and research on OA development trends have become a focal point that the academic community cannot ignore. Particularly in the past year, as controversies in academic circles and global OA movements have been vigorously promoted and implemented worldwide, it is evident that open access represents the general trend for the entire research and academic industry, with deeper open access being the future of academic publishing.

With further globalization development, countries will engage in more in-depth cooperation, and the interdisciplinary and cross-regional nature of academic research will be greatly enhanced. These collaborations will further promote academic exchanges between countries and across fields, and OA publishing is a more suitable approach for this trend. Although global poverty is decreasing, the wealth gap between countries continues to widen. Scientific powerhouses need to provide knowledge assistance to scientifically less-developed countries, sharing new research findings with scholars from other nations.

Currently, China's academic publishing industry remains in a confused and stagnant initial exploration stage regarding international OA trends. While domestic scholars have begun to pay attention to this issue, 梳理 ing foreign OA movements and evolutionary milestones and publishing related research findings, China still lacks adequate policy foundations for knowledge sharing and open access to literature in academia, insufficient financial investment support, and insufficient coordination management among publishers, journals, universities, and other stakeholders. As the global OA trend gradually reaches a critical juncture, domestic academic institutions should monitor developments in international academic publishing, promptly absorbing and drawing upon relevant business experiences in journal management and publishing operations. This will help maintain dynamic equilibrium within the academic publishing ecosystem, construct a high-quality research system and paper publishing mechanism, achieve sustainable development through continuous optimization, lower the barriers to accessing academic papers and research findings, and promote the indiscriminate sharing and dissemination of academic resources. This will allow knowledge to move from closed to open, enhance the visibility and usability of open-access science and academic journals, and improve China's scientific research capabilities, international influence, credibility, and discourse power.

2. OA Forms and Type Analysis

2.1 OA Initiatives and Evolutionary History

Open Access (OA) is defined as providing free full-text access to academic information and research findings via the internet while respecting authors' rights, with costs generally covered by publishers. The concept of a publisher-pays model can be traced back to the 1940s when nuclear physicist Leó Szilárd jokingly suggested that researchers should pay for their own publications when entering academia as a way to curb low-quality papers. In 2002, the *Budapest Open Access Initiative* emerged from a small international scholars' meeting in Budapest, forming the conceptual prototype of the OA movement. Subsequently, following the release of the *Bethesda Statement on Open Access Publishing* and the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities*, the term "open access" was formally defined.

Open access must satisfy two conditions: First, authors and copyright holders must grant all users free, irrevocable, worldwide usage rights; second, they must permit the public copying, use, distribution, transmission, and display of their works in any digital media form for reasonable purposes, as well as the creation and distribution of derivative works.

After more than a decade of global OA advocacy and initiatives, a group of influential research funders announced a bold commitment in 2018 to further dismantle journal paywalls, end subscription models, and achieve knowledge sharing and universal access: scientists they fund should publish their peer-reviewed papers outside journal paywalls. Its planned start date of 2020 was

postponed, and details were adjusted. However, after numerous policy debates, the initiative officially launched in 2021, with 25 funding agencies introducing similar open access mandates and regulations. Plan S participants are primarily research funding agencies, requiring that all research results funded by member institutions must be published in OA journals, on OA platforms, or made available through OA repositories without embargo periods starting from January 1, 2021. Despite the complexities Plan S has introduced, it has catalyzed transformation in the OA field. Journals that previously did not offer immediate pathways for publishing peer-reviewed articles now provide them for authors with Plan S funders, and experiments with open access business models are flourishing. According to Colleen Campbell, coordinator of OA2020—a consortium dedicated to replacing subscription business models with OA publishing—all of this heralds the realization of open science. Plan S may also help transform the metric management culture of modern science. Signatory funders state that when granting funding for academic research outcomes, they will value the "intrinsic value" of researchers' published papers rather than where they are published or any external factors beyond the content itself.

2.2 Open Access Type Analysis

Currently, OA is mainly divided into three types. Green OA and Gold OA are mainstream publishing models and open access pathways, while Diamond OA is an emerging concept with the potential to become a future trend in academic publishing.

Gold OA (Gold Open Access) is the most familiar OA publishing type for researchers. Gold OA allows everyone free, permanent access to the final version of an article (i.e., the post-print version) immediately after publication. This approach clears most permission barriers, with authors retaining article copyright. Articles published through Gold OA can appear in fully OA journals (where all content is OA) or hybrid journals (subscription journals with OA options). Gold OA enables readers to immediately read published works for free, maximizing article views, downloads, and citation rates. However, Gold OA typically requires authors to pay high APCs (Article Processing Charges) to journals and publishers, placing certain demands on the financial circumstances of authors and their institutions. For example, the well-known publishing house Springer Nature charges authors up to €9,500 for Gold OA publication starting from January 2021.

Green OA (Green Open Access), also known as self-archiving, involves authors depositing submitted manuscripts into repositories, including initial manuscripts, unpeer-reviewed manuscripts, or post-print versions. However, which version can be made public after the embargo period is determined by funders or publishers. Therefore, compared to Gold OA, Green OA article copyrights are typically retained by publishers or funding agencies, with specific terms and conditions determining how and when articles can be made publicly accessible in repositories. This is known as the embargo period, usually 6–24

months after publication. Green OA is available in most fully OA journals and hybrid journals. Although more affordable, the final version of articles cannot be immediately opened and accessed by readers, and peer-reviewed revised versions cannot be promptly updated and stored.

Diamond OA represents another iteration following Green and Gold OA, also indicating future development trends and frontier directions for open access. On March 2, 2022, Science Europe, cOAlition S, the Open Scholarly Communication in the European Research Area for Social Sciences and Humanities (OPERAS), and the French National Research Agency (ANR) jointly proposed the "Diamond OA Action Plan" to further develop and expand a sustainable, community-driven diamond OA scholarly communication ecosystem. Diamond OA refers to publishing open access journals without charging author fees, making them free for both authors and readers. Since they do not directly charge readers or authors, such publishers typically require external funding sources, such as advertising sales, academic institutions, scholarly societies, philanthropists, or government grants. Currently, the number of articles published in Diamond OA journals is significantly smaller than in other journal types. However, with the emergence of large public support platforms (such as SciELO and Redalyc), the Diamond OA model has succeeded in Latin America while being less successful in other world regions. In the "Diamond OA Action Plan," Diamond OA represents a system of relatively independent journals and platforms that will benefit from resource sharing. Currently, some Chinese journals have adopted the Diamond OA model, including those selected for SCI and the "China Excellence in Science and Technology Journals Action Plan," most of which are jointly launched by sponsoring institutions and international publishing houses. Some journals also adopt the Diamond OA model during their initial launch phase to enhance their influence. Thus, although various initiatives and agreements exist to ensure OA model standardization, journals and publishing institutions can still explore innovations and develop academic publishing directions and models truly suitable for themselves.

3. Coexistence of Open Access Advantages and Crises

OA enables publications and academic research to be freely available online to everyone without restrictions on reuse. For authors, this undoubtedly brings broader distribution, and such multi-channel, unrestricted distribution means increased visibility and citation counts, directly enhancing authors' academic impact metrics. On the other hand, academic research findings can also move beyond the academic "ivory tower" to face a wide range of social groups and organizations across various professional fields, allowing academia to be applied practically in social construction and shaping rather than remaining confined within "academic circles." Peter Suber, director of the Harvard Open Access Project, states that OA is a fusion of tradition and new technology, making unprecedented public goods possible. Here, "old tradition" refers to the scientific spirit, while "new technology" is the internet. However, it is worth noting that

while open access opens the door for readers to acquire knowledge, it may be a hindrance for authors. Valsiner notes that "developments in scientific publishing have led to a neo-colonial state at the source, where the 'majority' of publications come from those parts of the world that can afford publication fees… Open access may equal closing it at the other end." Additionally, the emergence of "predatory journals" warrants our vigilance, as it could lead to results contrary to scientific globalization.

3.1 Low Access Costs Bring Strong Radiating Power, Comprehensively Improving Citation Counts and Author Academic Influence

Academic impact is frequently measured by citation counts, which remain the fundamental "currency unit" for researchers, research groups, institutes, and universities. Steve Hitchcock demonstrated that non-OA papers are twice as likely to remain uncited six months after publication compared to OA articles. Furthermore, OA articles receive more than double the average citations of non-OA articles. In summary, evidence indicates that OA is broadly associated with increased academic impact in terms of citations.

3.2 Academic Research No Longer Works Behind Closed Doors; Open Sharing Promotes Multi-Stakeholder Participation in Research Discussions

Today's academic articles still remain within the "ivory tower," often criticized by outsiders as "impractical and empty." Many articles are based on "working behind closed doors," lacking practicality and operability, without conditions for implementation, and having few connections with the outside world. This is partly attributable to the high barriers to accessing current databases and academic journals. Without being current students or faculty, it is difficult to obtain free trial access to databases and platforms. Simultaneously, academic article evaluation systems cannot extend to outside society, as evaluation standards within academia such as citation rates are difficult to transplant to the social level, making the real-world social benefits of academic articles relatively vague and hard to assess. However, the emergence of open access pathways will significantly change this situation. When academic articles can be shared, discussion and participation will no longer be limited to universities and research circles, enabling such academic research to truly guide action and be put into practice, generating substantive social impact. Meanwhile, the influence of research findings can receive more equitable evaluation and measurement. Academic research impact is reflected not only in citations within research papers but also in professional behaviors such as using papers to formulate policies, learning, teaching, and product development, which are often manifested in news reports and social media (including blogs, forums, Twitter, Facebook, WeChat, QQ), as well as information releases from universities, enterprises, and governments.

Altmetrics, a non-traditional alternative evaluation method, provides perspec-

tive on the broader social impact of open-access academic articles. When OA articles are reported by news media or discussed on social media channels, Altmetrics can detect and track non-citation behaviors such as document downloads, views, collections, shares, and comments, all of which can serve as metrics for evaluating the influence of such open scholarly literature. As can be seen, open-access academic research findings can also improve the scientific research evaluation system, correcting injustices and narrow evaluation perspectives in existing methods that rely solely on impact factors and H-index to assess research capabilities. In reality, as mentioned above regarding access barriers and other limiting factors, open-access articles have significant metrological advantages and stronger diffusion capabilities compared to non-open-access literature. Articles available through open access can be searched, read, and applied by multiple social stakeholders through various platforms and media channels (such as journal official websites, search engines, WeChat Search, Weibo, Zhihu), thereby transforming conceptual ideas and top-level designs into actual product development or policy formulation. In other words, low access costs break down barriers and 隔阂 between academic circles and social environments, facilitating broad participation from multi-industry, multi-level stakeholders in discussions and exchanges on academic topics.

3.3 Monetized "Predatory Journals" Grow Wildly, Undermining Sustainable Academic Communication Fields

Predatory journals were first proposed by Jeffrey Beall, a librarian at the University of Colorado Denver. They refer to journals that exploit academic open access, using the gold OA (author-pays) publishing model as a pretext to quickly and easily generate profits. These journals are almost exclusively online-only; authors can publish quickly upon paying certain page fees (pay-to-publish), following lax or non-existent peer review procedures and providing no scientific rigor or transparency. Consequently, authors receive false, low-quality peer reviews from editorial boards that are "unworthy of their names."

Such journals essentially exploit loopholes in the open access movement for profit, with their purpose being not the sharing and universal benefit of research findings as advocated by OA initiatives, but rather collecting high page fees to generate profits. Over time, this leads to bad money driving out good, squeezing the survival space of high-quality academic journals and publishing institutions, while the number of such purely commercial journals will proliferate. Their wild growth not only reduces the quality of China's academic research findings, infringes upon authors' rights, harms research culture, and produces serious negative impacts on academic publishing, academic evaluation, and scientific research itself, but also threatens China's research integrity and the construction of a science and technology powerhouse. In a 2015 empirical study, Sorokowski P confirmed the profit-driven nature of certain commercial publishing institutions and the current industry chaos in academic publishing under the open access environment by submitting false editorial position applications to 360 journals.

3.4 Commercial Publishing Profit Lever Tilts, Profit-First Approach Squeezes Survival Space for Quality Journals

Traditional publishers can be roughly divided into four categories: scholarly societies, university presses (such as Cambridge, Oxford, Princeton), strict commercial publishers (too numerous to list), and "predatory" commercial publishers (everyone has their own examples at hand or in their email). In fact, cooperation between scholars and the first three types of publishers complies with industry regulations and standards. Moreover, well-developed scholarly societies and university presses typically adopt commercial publishers' operational models. There is nothing wrong with profit-oriented publishing, and it is natural for commercial publishers to try to maximize their profits. However, the problem arises when their profits and income come from writers rather than readers, leading to well-funded academic organizations or groups finding it difficult to conduct in-depth content and research cultivation, instead opting to quickly publish research findings through more "direct and simple" methods. In traditional publishing systems, declining paper quality leads to decreased subscriptions, resulting in revenue loss—in most cases, subscription numbers, revenue profits, and manuscript quality are proportional. However, under this scheme, open access means the concept of subscription disappears, and the open sharing interface loses the subscription profit lever and third-party supervision and evaluation from readers. This creates a risk that journals that previously published high-quality manuscripts with strict review standards may experience declining standards. Worse still, quality journals may reject excellent works based on how much profit APCs generate. Obviously, this will directly lead to declining quality of academic achievements and foster unhealthy tendencies within academic research circles.

4. China's Open Access Development Path and Specific Measures

4.1 Innovate and Diffuse OA Activities and Promotion, Utilizing Interpersonal and Online Dual Channels to Build Open Access

At the Open Access Week (OA Week), a global academic exchange event held continuously for over a decade, China should also absorb and draw upon other countries' innovative themes and promotional practices for OA Week to attract more individuals, groups, and institutions to understand and participate in OA-themed activities. This will enhance the diffusion effect of OA academic sharing and open access concepts, strengthen people's basic understanding of open access as an academic concept, and further realize the vision of interdisciplinary, cross-regional, and cross-border academic sharing and knowledge universal benefit.

Open Access Week is a global academic exchange event organized by the Scholarly Publishing and Academic Resources Coalition (SPARC), formally established in 2009 based on Open Access Day activities from 2008, and has been

held for over ten years. During the first four years after OA Week's formal establishment, event organizers were self-appointed by research institutions and universities in various countries, which spontaneously determined and carried out activity themes. Since 2012, the OA Week Advisory Committee has been established. The committee designs and determines official OA activity themes by discussing current environments and latest developments. Committee members consist of representatives from 29 international organizations, research institutions, and funding agencies, including the United Nations, European Union, SPARC, PLOS, and the Gates Foundation. Their academic and research capabilities are recognized by the industry, providing strong credibility and authority, which also enables high-quality OA Week activities with broader communication power, influence, and recognition. Meanwhile, academic organizations and institutions worldwide use the official theme as a foundation to develop their own sub-venue themes based on actual conditions and real challenges, holding corresponding activities to jointly discuss and promote local open access and knowledge sharing processes.

Although the OA movement was formally conceptualized and defined by the *Bethesda Statement* and *Berlin Declaration* in 2002, and has been ongoing for over 20 years, its popularization, dissemination, and practical influence in China remain insufficient, still stagnating within certain fields or groups and limited to partial circles. It is not uncommon for university teachers and students to have never heard of this concept, indicating that there is still room for improvement in OA implementation and operation in China. Rogers defines diffusion as the process by which an innovation (a new thing or idea) spreads among members of a social system through communication channels over time. Since diffusion involves the adoption of new ideas and can trigger social change, it is a special type of communication process. Rogers identifies factors affecting the diffusion process of new things: characteristics of innovations (relative advantage, compatibility, complexity, observability, trialability); communication channels (mass communication and interpersonal communication); characteristics of adopters (innovators, early adopters, early majority, late majority, laggards); social systems (optional, collective, authority, contingent decisions); and the role of innovation agencies.

China can have well-known institutions, platforms, schools, and organizations in the publishing, science and technology, and education sectors take the lead as innovators and early adopters, inviting OA leaders in academic circles to conduct large-scale lectures and speaking events. Through mass communication, the concept of open access can be promoted on official websites and media matrix accounts of various universities and institutions, establishing multi-channel, multi-platform information dissemination pathways to achieve preliminary concept popularization and cognitive establishment. In fact, China has been following international trends in this regard, conducting OA practice activities annually since 2012 in the form of speeches, exhibitions, or roundtable forums, actively discussing practical problems and solutions in China's academic publishing industry. However, such roundtable meetings and traditional promotion

methods cannot reach what Rogers calls late followers and laggards, who even have difficulty accessing knowledge popularization channels such as university or professional academic institution official websites. Therefore, to better diffuse and promote OA, we should utilize current short videos, live streaming, audio, and graphic formats to vividly and vividly explain academic concepts closely related to open access activities such as OA, DOAJ, and APC. Obscure professional terminology should be decoded and translated into accessible language, transforming lengthy texts into visual, interesting popular science short videos or 10-minute audio formats, and promoting them on social media platforms with large user bases such as Douyin, Kuaishou, Weibo, Ximalaya FM, and Xiaoyuzhou, enabling more people to understand the connotation and implementation pathways of this activity.

On the other hand, regarding activity formats, China should learn from the UK and Spain's OA Week approaches. In addition to traditional academic conferences and speaking forums, we can attempt promotion through video screenings, online games, and interview interactions with librarians or OA journal managers. We should conduct targeted theme refinement and incorporate more operational and practical process explanations, such as how to publish open access papers and how to obtain funding support from Plan S. Only in this way can we effectively promote open access, interpret it using knowledge and scenarios from various disciplinary fields, and obtain implementable creative inspiration and research findings through interdisciplinary thinking, exchange, collision, and discussion.

4.2 Improve Standardized Processes and Normative Policies for Open Access, Strengthen Monitoring and Management of Publishing Institutions

On March 15, 2022, *Nature* published research by the Inter Academy Partnership (IAP) from 2020 to 2022 on predatory journals and conferences. The report shows that predatory journals exploit researchers' pressure to publish to extract profits. Currently, conservative estimates indicate that predatory journals have exceeded 15,500 species, with some sources suggesting that predatory conferences have even surpassed legitimate academic conferences and are growing rapidly. As mentioned above, with further promotion and popularization of open access, academic misconduct is quietly breeding, and profit-driven "predatory journals" continue to grow wildly. When journal interests become intertwined with scientific quality, not only will it fail to further develop open access activities and consume their credibility, but it will also cause decline and chaos in the existing academic research system. Therefore, China's scientific community should promptly identify problems and address various challenges in open practice exploration. Chinese academia should re-evaluate and optimize the academic publishing system and research evaluation framework, improve standardized processes and normative policies for open access, strengthen supervision and management of publishing institutions, and establish "blacklists"

and early warning journal lists to maintain a healthy environment for academic sharing and exchange platforms, protect the credibility and legitimacy of research resources, and shape an integrity-based research and academic publishing landscape.

In December 2020, the Journal Citation Reports team of the National Science Library, Chinese Academy of Sciences, officially released the *International Journal Warning List (Trial)*, which "identifies academic journals with risk characteristics and potential quality issues through comprehensive evaluation of journal article volume, author internationalization degree, rejection rate, APC, journal transcendence index, self-citation rate, retraction information, etc.," contributing to building a healthy ecosystem for China's scientific research development. Additionally, for non-transparent APC fees, in-depth research and interviews should continue, and unified standards and policies should be formulated based on industry conditions to effectively control the charging mechanisms of non-compliant journals and further supervise the use of China's research funding. With the establishment and improvement of this series of measures, we believe they can provide references and warnings for researchers and scholars to prevent them from falling into predatory journal traps. When submitting manuscripts, authors should keep their eyes open and choose publishers certified by international industry associations such as COPE, OASPA, and STM. They should also check the quality of journal peer review reports and whether renowned scholars in the field serve on editorial boards and whether the number of editorial board members matches publication volume through third-party peer review report and reviewer qualification certification platforms such as Publons.

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Note: Figure translations are in progress. See original paper for figures.