International Open Access Developments in 2014

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Abstract

[Purpose/Significance] The development of open access has received widespread attention from all stakeholders. Understanding the development dynamics of major participants worldwide helps libraries grasp the trends of open access development and the opportunities it brings, enabling them to participate in open access and address challenges. [Method/Process] This study tracked open access policies, research reports, project plans, and news updates from major government agencies, research funding bodies, research institutions, publishers, and international organizations worldwide in 2014, and conducted inductive analysis based on these materials. It summarized the specific progress and development trends of international open access practices in 2014 from perspectives including open storage, open publishing, and the organization and utilization of open resources. [Results/Conclusion] In 2014, the integration trend in open storage intensified, with a shift toward open data storage; open publishing transitioned from experimentation to policy support; and the organization and utilization of open resources deepened, moving from catalog-level disclosure to resource integration. In the historical tide of open access development, libraries serve as an indispensable backbone force.

Full Text

Preamble

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Abstract

[**Purpose/Significance**] The development of open access has garnered widespread attention from all stakeholders. Understanding the developments of major participants worldwide helps libraries grasp the trends of open access, seize the opportunities it presents, actively participate in open access initiatives, and respond to related challenges. [**Method/Process**] This paper tracks open access policies, research reports, project plans, and developments released by major government agencies, research funding bodies, research institutions, publishers, and international organizations in 2014, and summarizes them accordingly. It reviews the specific progress and development trends of international open access practices in 2014 from the perspectives of open archiving, open publishing, and the organization and utilization of open resources. [**Result/Conclusion**] In 2014, open repositories showed enhanced consolidation trends and shifted toward open data archiving, while open publishing moved from experimentation to policy support. The organization and utilization of open resources continuously deepened, transitioning from directory discovery to resource integration. In the historical wave of open access development, libraries serve as an indispensable backbone force.

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1. The Significant Impact of the GRC Beijing Conference

In 2014, the Global Research Council (GRC) convened leaders in science and technology from various countries in Beijing to jointly promote open access. In his address to the conference, Chinese Premier Li Keqiang stated: "All countries should adopt multiple approaches to promote the broad dissemination and sharing of scientific knowledge… China pursues a mutually beneficial and win-win opening-up strategy… and supports the establishment of an open access mechanism for scientific knowledge funded by public finance to promote the common development of scientific endeavors in China and the world" [**?**]. The GRC conference focused on two themes: open access to scientific papers and the cultivation of young scientific talent. The open access to scientific papers represented a continuation of the discussion topics from the 2013 GRC General Assembly. Around the time of the 2014 GRC conference, many countries introduced corresponding policies and measures to respond to the GRC's open access concepts.

The rapid development of open access has attracted widespread attention from government departments, international organizations, research funding agencies, research and educational institutions, publishers, and libraries worldwide. All parties have formulated open access policies and promoted open access development through open archiving and open publishing. Building on develop-

ments from previous years, countries such as the United States [?] and Mexico [?] continued to advance open access legislation in 2014. More international organizations (such as the American Geophysical Union [?] and the World Health Organization [?]) established open access policies. The creation of the Open Policy Network (OPN) [?] facilitated the development, adoption, and implementation of open access policies. Funding agencies introduced specific funding policies to support open publishing. These initiatives provided strong policy support for the development of open access.

China's scientific, publishing, and library communities have maintained continuous attention to open access, with relevant scholars consistently working to promote domestic open access development and research. For instance, Zhang Xiaolin et al. conducted extensive and in-depth research on the paradigm shift of research libraries in the open access environment [?], how to respond to open access [?], development trends and challenges of institutional repositories [?], open publishing funding policies [?], and the opportunities and challenges that open academic resources bring to libraries [?]. Chu Jingli et al. studied domestic practices in participating in open access publishing [?]. Li Lin et al. examined open publishing policies of traditional publishers [?]. Huang Jinxia et al. conducted theoretical discussions and practical summaries on the organization and construction of open resources (particularly open journals) [?]. Gu Liping et al. researched the indicator framework for evaluating and selecting open access journals [?]. Zeng Yan, Zheng Jiancheng et al. studied the SCOAP3 open publishing model and undertook the task of organizing domestic institutional participation [?]. Zhang Dongrong, Zhu Zhongming et al. promoted the creation, promotion, and services of the Chinese Academy of Sciences institutional repository [?]. Qing Xiuling introduced C.L. Borgman et al.'s research on scientific data sharing [?]. Additionally, the National Science Library of the Chinese Academy of Sciences actively collaborated with other institutions on related research, such as Zhang Xiaodan, Qiao Xiaodong et al.'s investigation of Chinese academic journals' attitudes toward institutional repository deposit policies [?], and Yao Xiaoxia, Nie Hua et al.'s survey and analysis of the current status of institutional repository construction in China's research and educational institutions [?]. Song Haiyan et al. investigated and analyzed Chinese researchers' awareness and use of institutional repositories [?].

Domestic open access development has gradually attracted more attention. Continuously tracking global open access progress can support China's open access development. This paper tracks the latest developments in open access, summarizes the key changes in 2014, predicts future trends, and provides references for libraries to participate in open access and respond to the opportunities and challenges it brings.

2. Open Archiving: Institutional Repository Consolidation and Scientific Data Sharing

As one of the main practical forms of open access, open archiving has received policy support from more relevant institutions worldwide [**?**]. The trend toward repository consolidation has strengthened, and open archiving of research data has become a development priority.

2.1 Institutional Repository Alliances Promote Cross-Regional Integration

After years of development, open access repository systems have become relatively well-established. Under the incentive of national and funding agencies' open archiving policies, an increasing number of participants have joined open archiving. To maximize the visibility of institutional repository resources and ensure these resources are well-maintained and fully utilized, institutions can adopt measures such as optimizing search engines, integrating repositories with external discovery services, and promoting repositories to local researchers and administrators. As research becomes increasingly globalized, distributed, and interdisciplinary, repository infrastructure must reflect the needs of research communities and ensure researchers' access to scientific achievements worldwide. Therefore, repositories need to be integrated to achieve interoperability among them.

Interoperability among institutional repositories requires establishing good interoperability standards [**?**]. On March 20-21, 2014, representatives from major national and regional repositories in Australia, Canada, China, Europe, Latin America, and the United States gathered in Rome to jointly discuss and formulate collaborative strategies for repository activities and repository network integration. They agreed that repository networks should adopt common standards among networks to support interoperability, enable cross-regional data exchange, enhance cross-regional access to repository content, and maximize the value of research outcomes [**?**]. On October 8, 2014, the Confederation of Open Access Repositories (COAR), the Consortia Advancing Standards in Research Administration Information (CASRAI), and regional repository networks established an international organization to improve interoperability among open access repositories. The working group's purpose is to develop an implementation roadmap that clarifies the main steps required to ensure greater interoperability among repository networks and between repository networks and other relevant systems and stakeholders (publishers, current research information systems, etc.) [**?**], with the complete implementation plan already published [**?**].

2.2 Institutional Repositories Actively Experiment with Scientific Data Management Services

The open sharing of research data is significant for maintaining data integrity, preventing scientific fraud, reducing redundant time and financial investment,

and facilitating follow-up research. While research data sharing receives support from legislation [?], policies [?], and initiatives [?], the open archiving, dissemination, and reuse of research data have become priorities for open knowledge base development. According to statistics from SHERPA JULIET [?], among the 146 funder policies it 收录, 26% require research data archiving, 12% encourage archiving, and 61% have no requirements. As early as February 2013, the U.S. White House Office of Science and Technology Policy (OSTP) issued the "Memorandum on Increasing Access to the Results of Federally Funded Scientific Research," requiring all federal agencies with annual R&D funding exceeding $100 million to ensure open access to research outputs (including peer-reviewed publications and data) from funded projects. It also required relevant federal agencies to submit draft plans within six months of the memorandum's release, encouraging the deposit of research outputs in repositories. Subsequently, the SHARE project [?] (SHared Access Research Ecosystem) was created, jointly established by the Association of American Universities (AAU), the Association of Research Libraries (ARL), and the Association of Public and Land-grant Universities (APLU) to ensure the long-term preservation, access, and reuse of research outputs and to help stakeholders discover research across repositories, supporting federal archiving. Additionally, the EU launched the Open Research Data Pilot [?], requiring funded researchers to formulate a detailed data management plan when applying, deposit research data in repositories, and assign unique identifiers to research data, aiming to maximize the access and utilization of research data generated by research projects.

3. Open Publishing: Funding Shifts and Policy Support

As one of the main implementation pathways for open access to academic papers, open publishing has gradually gained recognition through publishers' active practices and exploration of business models, and has also received policy support from some countries such as the UK, Ireland, and Italy. The UK Research Councils (RCUK) released revised open access policies and guidelines in March 2013 [?], proposing that starting from April 1, 2014, RCUK would, while accepting open archiving, prefer the "gold" route to publish all or part of publicly funded research results in open access journals and make them available to the public without restriction under CC BY licenses, with the goal of achieving immediate, unrestricted online access to 75% of RCUK-funded research papers through open publishing. These initiatives have pushed the UK's open access movement to a new stage. In 2014, funding agencies, publishers, research and educational institutions, and other stakeholders gave more widespread attention and support to open publishing, promoting its development through funding, creating open access journals, fee reductions, pilot projects, and various forms of cooperation.

3.1 Open Publishing Receives Policy Support from Funding Agencies

There are multiple funding models for open publishing of academic papers [?], such as special grants, project funding, institutional support for authors, group payments, and consortium funding. In 2014, as funding agencies adjusted their policies, they gradually shifted their funding focus toward open publishing. A 2014 survey of 64 funding agencies with feedback results [?] found that most funding agencies allow grantees to use project funds to pay Article Processing Charges (APCs). The UK's National Institute for Health Research (NIHR) and Department of Health (DH) stipulate that NIHR-funded researchers must publish their research results in peer-reviewed journals that follow open access policies and provide detailed regulations on APC payment methods [?]. On September 6, 2014, the Charity Open Access Fund (COAF) was established to cover relevant open access and article processing fees, enabling published works from research supported by COAF's joint founding institutions to be freely and unrestrictedly accessible. COAF will provide substantial funding to 36 UK universities and research institutions [?] to promote immediate open access to the latest medical research results. Funding for open publishing has moved from "experimental fields" in 2013 to institutionalized development in 2014, particularly through clear policy implementation regulations.

3.2 Traditional Publishers Accelerate Transformation to Open Publishing

Traditional publishers' participation in open publishing can be divided into full open publishing models and hybrid open publishing models [?]. With the support and encouragement of funding policies, traditional publishers have taken the following measures: (1) Introducing open access policies, such as Liverpool University Press [?] and Jordan Publishing Company [?]; (2) Creating new open access journals, such as the Royal Society [?]; (3) Converting subscription journals to hybrid journals to implement open publishing, such as the Electrochemical Society [?]. Notably, as well-known publishing groups, Elsevier, Springer, NPG, and Brill continue to create new open access journals. As of July 21, 2014, Springer already owned 417 open access journals, with the total number of open access papers published reaching 200,000 [?]. On October 22, 2014, NPG joined the Open Access Scholarly Publishers Association (OASPA) to expand its open publishing business.

3.3 Library Subscription Fund Transfers—Supporting OA Publishing

While funding agencies support open publishing, they face a "double payment" phenomenon: funding agencies allow authors to use research funds to pay APCs for hybrid journals while also using fiscal funds to subscribe to these hybrid journals. Without deduction mechanisms, publishers earn "additional APC revenue," which to some extent helps publishers maintain the subscription journal model. To effectively address the cost issues of open access publishing, universities and funding agencies sign agreements with publishers to negotiate subscrip-

tion fee offsets against article processing fees, using the offset subscription fees to pay authors' APCs. On May 27, 2014, the Institute of Physics (IOP) announced the launch of a three-year pilot project to explore a mechanism for deducting hybrid journal subscription fees based on the proportion of open access papers. Twenty-one UK universities participated in this pilot project, where the APC expenses for papers published by researchers from these universities in IOP journals in 2014 would be offset against 2015 subscription and licensing fees based on the proportion of open access papers, with this model continuing thereafter [**?**]. Although APCs are typically paid by researchers from their research grants or departmental budgets, subscription fees usually come from university library budgets. The local deduction method adopted by IOP Publishing ensures reasonable deduction of library subscription expenses.

3.4 Academic Associations Encourage Faculty to Publish Open Books

Open book publishing gained attention in 2013, with many funding agencies and research institutions extending their open access policies to include open books. In 2014, as funding agency policies tilted toward open publishing, some institutions shifted their funding focus to the digitization and open access of book publications, establishing publication cost options in funded project budgets (such as the Swiss National Science Foundation [**?**]). According to relevant information [**?**], open publishing business models for books and monographs existing before 2013 included: the OpenEdition free 增值 model, the crowdsourcing model, and the library funding model represented by the Knowledge Unlatched project. In 2014, a new funding model emerged—the faculty stipend model. On June 12, 2014, the Association of American Universities (AAU) and the Association of Research Libraries (ARL) released a charter for subsidizing academic monographs in the humanities and qualitative social sciences, providing funding in the form of faculty rank stipends for the first peer-reviewed book published by North American university faculty, while making the work publicly accessible as an electronic publication [**?**]. This stipend model will help address issues such as the monograph market, offering opportunities to publish monographs without commercial return concerns, maintaining stable institutional cost systems, ensuring high quality, broadening distribution channels, improving content visibility, and providing high institutional return on investment. It plays an important role in ensuring the long-term economic vitality of grant-funded academic monograph publishing and promoting the emergence of innovative digital models.

3.5 Stakeholders Jointly Promote Open Publishing

In advancing open publishing, funding agencies, research institutions, publishers, libraries, and publishing platforms promote its development through enhanced communication and various forms of cooperation.

3.5.1 University Libraries Play an Important Role in Open Publishing For example, the University of Alberta Library used OJS hosting services to build an open access publishing platform and, through cooperation with other institutions, created 29 peer-reviewed academic journals related to University of Alberta Library scholars and faculty [**?**].

3.5.2 Agreements Signed to Secure Publishing Discounts Funding agencies and research institutions sign open publishing agreements with publishers on behalf of authors to concentrate efforts on securing publishing discounts. For instance, the Max Planck Society and PeerJ signed a publishing agreement on September 9, 2014, allowing thousands of authors from over 80 Max Planck research institutions to publish their peer-reviewed articles in PeerJ without any fees [**?**].

3.5.3 Publishers Migrate Publications to Open Platforms Publishers strengthen cooperation with open publishing platforms and migrate their publications to open platforms. For example, a Polish publishing group migrated its three leading industry journals to the HighWire open platform. The new journal website will provide access to over 10,000 pages of research results published annually, and by mid-2015, the HighWire platform will include all paper catalogs from the past 100 years [**?**]. Following this, the University of California Press will migrate its journal content to the HighWire open platform starting mid-2015 [**?**].

4. Open Resources: Integration Services and Utilization

If open archiving is an important task for libraries to support their institutions in managing knowledge assets, and open publishing is a measure for libraries to support their service objects in effectively disseminating innovative achievements, then open resource construction represents a new strategic development direction for libraries and librarians to innovate and continuously improve themselves. After more than a decade of development, open resources have become rich and diverse in type and have reached a certain scale. Faced with such abundant and numerous resources, research on the organization and utilization of open resources continues to develop. As shown in Table 1 :

Table 1. Status of Some Open Resource (Systems)

Open Resource Platform/Institution	Resource Type	Resource Volume
CSIRO Science Image	Open Images and Videos	4,110 images and videos

Open Resource Platform/Institution	Resource Type	Resource Volume
Dryad	Professional Domain Data Repository	7,899 data packages, 24,678 data files, 387 journals, 28,407 authors
Museum of New Zealand Te Papa Tongarewa	Open Images and Videos	Over 30,000 images
Open Content	Open Images and Videos	Over 99,000 images
Open Data	Open Images and Videos	244,034 datasets
Open Video Project	Open Images and Videos	4,079 videos
OpenAIRE	European Open Access Research Infrastructure	9.98 million publications from 579 data sources
OpenCourseWare	Open Educational Courseware	3,084 courseware (including 217 audio/video)
OpenDOAR	Open Repository Directory	2,811 repositories (as of March 1, 2015)
re3data.org	Open Subject Repository, Research Data Repository Registry	1,166 research data repositories
The Metropolitan Museum of Art	Open Institutional Repository	404,336 records
The World Bank OKR	Open Educational Resources	18,350 research products (as of March 2015)
The Orange Grove	Open Educational Resources	78,535 records (including open courseware, open e-books, etc.)

Note: Resource volume data, unless otherwise dated, comes from website information as of March 19, 2015.

4.1 Open Resources Transition from Directory Discovery to Integration Services

The types of open resources are becoming increasingly diverse, and their quantities are growing rapidly (see Table 1). Moreover, these open resources are distributed across different locations, affecting their full utilization. To comprehensively utilize these open resources, a series of integration and resource discovery platforms have been developed, with directory discovery platforms being the most common, such as DOAJ, DOAB, and OpenDOAR. However, faced with so many open resources, simple directory discovery can no longer meet user needs. Libraries must transform their collection development strategies [**?**], incorporate open resources into locally controllable collections, organize open resources, and provide integrated services. In 2014, numerous integration service platforms emerged for different types of open resources. For example, the National Science Library of the Chinese Academy of Sciences is actively practicing the creation of various open resource harvesting service platforms, providing integrated services and retrieval, browsing, download, and journal submission recommendations for open access journals and papers [**?**], open science courseware [**?**], open conferences [**?**], and open socioeconomic information [**?**].

4.2 Information Disclosure of Open Resource Licensing Agreements

Open access is an increasingly popular scholarly communication model. Open access scholarly resources, represented by academic journals and papers, have become indispensable resources for academic research and are increasingly trending toward "mainstreaming" [**?**]. After libraries collect, organize, arrange, and integrate open resources, they inevitably face licensing agreement issues when providing efficient services. Currently, open access content aggregators and platform providers actively propose several solutions for resource status and licensing status. Additionally, in early 2014, the National Information Standards Organization (NISO) solicited implementation opinions on the draft open access metadata and indicators (NISO RP-22-201x) [**?**]. The draft discusses the adoption of metadata indicators, metadata transmission mechanisms, and recommended licensing agreements, proposing two core metadata elements and related tags: `<free_{{{to}}_{{read}}}>` and `<license_{ref}>`, aiming to reveal whether a specific work is open access and what reuse permissions should be granted [**?**]. The Confederation of Open Access Repositories (COAR) expressed support and proposed amendments [**?**]. The OpenArticleGauge (OAG) website [**?**] provides services for searching, locating, and displaying paper access and reuse licensing information. By simply providing paper DOIs or publication IDs, one can find the licensing information and openness level used for that paper. Behind the organization, integration, and service of open resources is a process of 博弈 among different stakeholders.

Conclusion

In summary, the key developments in open access in 2014 include the following:

(1) Open access repositories have matured considerably. Through integration and interoperability among repositories, the visibility of repositories will be greatly enhanced. With the development of open data, supporting the generation, storage, dissemination, and reuse of research data will become a future development priority for repositories.

(2) Open publishing has received more funding and policy support. An increasing number of publishers, funding agencies, research institutions, and libraries have joined the open publishing movement and strengthened cooperation. Exploring subscription fee deduction mechanisms and breaking the traditional subscription journal model has become a trend. Open publishing continues to expand to monographs and books, giving rise to a new funding model—the faculty stipend model. With the introduction and implementation of funding policies, examining funding effectiveness will become the next focus of work for open publishing.

(3) After commercial experimentation with open resources, more public institutions are organizing and utilizing open resources. Future efforts need to explore more reasonable resource utilization and service methods, and establish institutionalized guarantees to ensure the sustainable use of open resources.

The following issues should be noted in promoting open access:

(1) Open access policies provide policy support for open archiving and open publishing. To understand and track the implementation effects of open access policies and standardize the open access process, supervision and review mechanisms need to be established to evaluate policy implementation effects [**?**].

(2) Libraries should actively undertake the construction and maintenance of institutional repositories, actively explore automatic push services from publishers to institutional repositories, and gradually establish a new library resource construction model that directly intervenes in the publishing "supply side" [**?**].

(3) Open publishing faces the issue of determining publication content quality. While proposing new strategies for content quality assessment [**?**], peer review methods must be continuously improved [**?**].

(4) To better acquire and utilize open resources, software tools (such as Paperity [**?**]) should be continuously developed to expand the scope of utilization (e.g., address data [**?**], banking data [**?**], and energy and environmental data [**?**] have been put on the utilization agenda).

(5) As open data receives more support from legislation, policies, and initia-

tives, relevant stakeholders have proposed specific implementation methods. The definition, acquisition, submission, organization, storage, and reuse of open data are becoming increasingly clear and standardized. To guide the advancement of open data, it is necessary to summarize best practices and develop implementation guidelines for open data.

(6) Enhance education and training for students, researchers, librarians, data managers, and other relevant personnel to improve their recognition of open access through appropriate curriculum education [**?**].

In the struggle for survival where the fittest survive, libraries, as knowledge service institutions, are at a turning point in the paradigm shift from traditional libraries to new types of libraries [**?**]. It is a general trend for libraries to adapt to environmental changes and continuously develop and transform, shifting from a traditional model centered on collections and passive service provision to a new model centered on users and active service provision. The convergence of open access, open knowledge, and open innovation (the 3Os) provides tremendous opportunities for knowledge service institutions to support user-driven knowledge service innovation [**?**]. Libraries should actively seize the opportunities of open access, restructure the knowledge service landscape, actively lead the development of open access, establish libraries' position in future scientific research learning environments, and contribute to scholarly communication.

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Author Contributions

Guo Jinjing: Formulated the paper outline, collected and organized materials, wrote Sections 1, 3, and 5, and revised the manuscript.
Peng Naizhu: Collected materials and wrote Section 2.
Zhang Mengxia: Collected materials and wrote Section 4.
Lu Cainü: Revised the paper outline and assisted with material collection.

Gu Liping: Revised the paper outline, provided supplementary information, and offered revision suggestions during the writing process.

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